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Conjunctivitis tularensis
(Squirrel-Plague Conjunctivitis)
Frederick W. Lamb

THE

Practical Medicine Series

COMPRISING TEN VOLUMES ON THE YEAR'S PROGRESS IN MEDICINE AND SURGERY

UNDER THE GENERAL EDITORIAL CHARGE OF

CHARLES L. MIX, A. M., M. D.

PROFESSOR OF PHYSICAL DIAGNOSIS IN THE NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

VOLUME III

The Eye, Ear, Nose and Throat

EDITED BY

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GEORGE E. SHAMBAUGH, M. D.

SERIES 1917

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DEPARTMENTS

The Eye

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PREFACE.

In spite of the World War, the year 1916 has been prolific of ophthalmic literature in its various departments. Now that the United States has entered the conflict, subjects bearing on the *Military Surgery of the Eye* assume an importance even greater than they formerly possessed. In consequence of this, the Editor considers it his duty to devote a larger amount of space to the chapter on this subject than he has given to any other. This decision, of course, necessitates the cutting down or elimination of some material gathered for other chapters.

In spite of war's alarms, America has been able to take part in a number of good works tending to the improvement of ophthalmology in general. Among these is the institution of the Board for Ophthalmic Examinations, which, unofficial though it is, will certainly have a tendency to standardize ophthalmic practice in this country.

Toward the end of the year 1916, a movement began to bring about a merger of ophthalmic journals in the United States. If this can be managed properly and the conduct of the combined periodicals governed by an efficient corps of editors, it is certainly a consummation devoutly to be wished.

The Editor of this department again desires to acknowledge the aid he has received through the use of the valuable abstracts made by the staff of *Ophthalmology,* and especially by its able editor, Dr. H. V. Würdemann; also of a number of careful reviews of articles from the *Annals of Ophthalmology* and from the new *British Journal of Ophthalmology.*

When occasion warrants, the Editor has appended remarks to the abstracted accounts of papers by other writers.

CASEY WOOD.

DISEASES OF THE EYE.

EXAMINATION OF THE EYE.

The Visual Standards Used in Medical Examination of Recruits in the British Army and in Continental Armies. A table showing the visual standard for recruits in the chief European armies has been published by Paterson and Traquair.[1] In France, Germany, Austria and Italy, the vision with glasses determines the acceptance or rejection of a recruit; whereas in Great Britain, it is the vision without glasses which counts. This difference is due to the fact that up to the commencement of the present war, the British army was organized largely for foreign service at a great distance from its base, where there might be difficulty in providing properly fitting classes. In the British army, the standard for general service requires *without correction* vision of 6/24 in the better eye and 6/60 in the worse eye, which must be the left. In Germany combatants are required to have corrected vision of at least 6/12 in one eye, while in the other eye, the corrected vision may be minimal, and in the Landstrum the second eye may even be blind. In the armies of Germany, Austria, France and Italy, more than six diopters of myopia are allowed. So far as shooting is concerned, it is generally agreed that vision of 6/12 at least is necessary, and on the continent it is believed that a soldier with 6/12 vision wearing glasses is more efficient as a combatant than another with 6/24 vision without glasses. Continental authorities have found that on an average soldiers who see best shoot best, and that those who wear correcting spectacles shoot better than those who do not.

(1) Lancet, May, 1916.

The authors conclude with the following summary:

1. The present sight test for general service for recruits for the British is by far the highest in Europe, and excludes from the fighting line large numbers of men who are freely used as combatants in the armies of the chief continental powers.

2. This is due to the fact that in the British sight test the vision without glasses (uncorrected vision) is what counts, whereas in the chief continental armies it is the vision with glasses (corrected vision) which counts.

3. In view of the present want of men there is urgent need for the immediate adoption of a remodelled sight test based on corrected vision, on the lines of the military visual standards in use on the continent of Europe.

Purkinje's Phenomenon in the Central Area of the Visual Field. The assertion of some observers that Purkinje's phenomenon (that many colored objects, especially red and blue, appear in the dusk in essentially different relations of lightness from those in bright daylight) does not occur in the central area of the retina because it is devoid of rods, even if the eye is dark adapted, because the cones are not capable of dark adaptation, is denied by E. Hering.[2] He describes a method of eliciting Purkinje's phenomenon very distinctly if the conditions are excluded that necessarily prevent its occurrence.

Hering believes that a too low intensity of blue light used in the experiments, undervaluation of the very intense absorption of the blue light by the pigment of the macula, insufficient consideration of the rapid local adaptation of the visual area corresponding to the retinal image of the colored field to a permanent illumination, and, finally, a too great general dark adaptation of the eye, may cause a complete failure of Purkinje's phenomenon in the foveal area.

Cards for Sight Testing in Schools. In an excellent article Edward Jackson[3] practically reviews the whole subject. He recalls the recent work of the Committee of the Section on Ophthalmology of the American Medical Association, in the direction of standardizing

(2) Graefe's Archiv f. Ophthal., Vol. 90, 1916.
(3) Ophthal. Record, March, 1916.

test cards that brought out strongly that *the letters of the alphabet furnish a poor test for measuring acuteness of vision.*

The different letters of the alphabet even when reduced to the "block letter" form, and a size to subtend a five-minute angle, vary in visibility more than one-third. Measuring visual acuity with them might be compared to measuring distances with a collection of "yard sticks" that varied in length from 30 to 40 inches. So long as one made all his measurements with just the same particular set of "yard sticks" he might get results that could be compared with one another. But they would be worth little for comparison with measurements made with a different group of "yard sticks."

The theory that a letter or figure of a certain shape can be seen twice as far if made twice as large (linear dimensions) is quite correct for practical purposes. But if applied to letters and figures of different shapes, it is quite untrue and misleading. The letter A, if of the same shape can be seen twice as far if made twice as high and twice as broad. But if the letter B is made twice as high and twice as broad as the A, it can not be seen twice as far. On some test cards it can be recognized but little farther than the smaller A. A miscellaneous series of letters or figures with their sizes proportioned to the different distances at which they are supposed to be visible, furnishes a very poor means of measuring visual acuity; although it does furnish a valuable means for the subjective testing of refraction. The cards of test letters in common use for sight testing in the schools have been prepared upon this inferior inappropriate plan; they are modifications of the test cards in use by oculists to measure ametropia with the test lenses. For sight testing in the schools we need cards worked out on a different basis, and for this particular purpose.

There are a number of appropriate figures from which to choose the one to be used in testing the sight of school children. Snellen worked out a very excellent one as a test for illiterates, sometimes known as the "E" test. The person tested is required to recognize the direction in which the arms of the figure are turned.

Landolt suggested the broken ring, the test being to recognize the direction in which the break in the ring is placed. The above tests are commonly made of such sizes as to subtend an angle of five minutes, at the distance they are supposed to be seen by an eye with standard vision. But the direction of the arms of the Snellen figure can be recognized at a greater distance or under a smaller angle, from four to four and one-half minutes. The writer proposed an incomplete square, the test be-

Fig. 1. Visual tests. A, The Snellen test for illiterates; B, The International broken ring; C, The incomplete square; D, Wolffberg's "Cross-point figure."

ing to see which side of the square is incomplete. This should be recognized when subtending an angle of three minutes. Wolffberg suggested four black squares symmetrically arranged around a white square, with a white circle in one of the black squares. The person tested is to indicate which of the black squares contains the white circle. These different tests are shown in Figure 1.

Among these different test figures the broken ring of Landolt has certain advantages: (1) When made to subtend an angle of five minutes, corresponding to that of test letters, the width of the black being one minute, and the break in the black one minute, it is a good test of standard vision. (2) The break in the ring can be placed in either of eight directions, up, down, right, left, or half way between these positions, while the other figures can only be placed in one of four positions. (3) The broken ring has been adopted and recommended as the international standard of visual acuity, by the International Ophthalmological Congress held in Naples in 1909. Hence the records obtained with this test are more likely to be exactly comparable with similar records obtained in other countries. (4) The broken ring placed at the center of a square or circular card constitutes an "unlearnable" test. It can be concealed an instant and turned in either direction; and the person tested

cannot rightly guess in which direction it is turned, more than once in four or eight times. A symmetrical group of such broken rings, as shown in Figure 2, can be placed at the center of a symmetrical card (square, circle, octagon, etc.,) and constitutes a test entirely unlearnable and very convenient to use. Some such test should replace cards of test letters for all testing of visual acuity of school children, railroad men, sailors, etc.

The International Test furnishes a fixed or constant standard. This is impossible with test letters. The nearest approach that Snellen could make with letters was to insist if all the letters on the given line were seen at the required distance the vision would be as indicated by the numbering. That is to say, the Snellen test de-

Fig. 2. International visual test arranged for testing vision at five meters.

pends on the perception of the hardest letter on the line. The test is often a single letter on each line. This letter is always in one position, and therefore inferior to the broken ring. The hardest letter to see on one line differs in visibility from the hardest letter on another line. The results obtained with two different "hardest letters" can not be properly compared. The broken ring gives a much better approximation to the limits of scientific accuracy in sight testing than can the letters. Moreover, the broken ring is as fair an equivalent for the Snellen letters at their best as we now have; and furnishes a good practical standard. While many eyes can pick out the break when the ring is at such a distance that it subtends an angle of less than five minutes, and so are credited with better than full standard vision;

this is necessarily true of a standard test that is in practical use for normal eyes, that vary widely in visual acuity.

The test is unlearnable. Many ingenious devices have been resorted to for the purpose of furnishing an unlearnable card of test letters. One of the earliest was Thomson's, in which the letters were arranged in radiating lines, only one of which could be exposed at one time. One of the late devices is Grow's, in which of 77 letters of similar size only one is exposed at a time. Various methods of exposing a single line at a time have also been devised. All such devices limit the number of arrangements of letters that can be used in each test without always making them really unlearnable. To defeat the ingenuity of candidates seeking to evade color tests Burch proposed to keep paints of the required colors, and paint in letters for each individual test. With the broken ring it is only needful to conceal the card and turn it; and a new test is obtained, as many times for the individual case as one chooses.

But the practical advantages of having an unlearnable test are much greater than the mere avoidance of deception or self-deception. Instead of requiring the test-card to be kept where it can not generally be seen, an important precaution with cards of test letters, the broken ring may be made perfectly familiar to the persons to be tested. The test may be explained and illustrated to a whole class, or a whole school; and each child may be drilled in how to answer, with the card close enough to be seen readily; before removing it to a distance where it will test the visual acuity to recognize it. With young children a great help in making the test accurate can be gained by emulation. When the test has been fully explained the card is removed beyond the distance it can be seen by any. Then tell the children that as soon as any one can see which way the break is turned he is to raise his hand; and then point out different rings and see if the break is recognized. When one child has demonstrated his acuteness of vision he can be dismissed. Then the rings are turned and again brought nearer until another hand is raised, and so on until the last. If one test gives a doubtful result any

number of tests can be made to confirm or correct it, because the test is unlearnable.

The test is more exact and easier to understand because it is made at a variable distance. On a card of test letters each line of letters is arranged for a certain fixed distance; and the person to be tested is always placed at a certain distance, usually 20 feet, and the test is to see which line of letters can be recognized at this distance. If one line is recognized, vision = 20/20, if another 20/30. There is no provision in the plan for intermediate grades of visual acuity. So much has this defect been felt, that it is very common to make up for it by such expressions as 20/20 mostly, 20/20 partly, etc. But with the test card of broken rings of a single size the acuteness of vision is ascertained by noting the distance at which they can be seen; and this distance can be noted exactly to any fraction of a meter or foot, that seems desirable. There are no breaks in the series of visual acuities that are thus measurable. Testing the vision thus, with figures of standard size, and recording it as proportioned to the distance at which they are seen, is a procedure more readily understood and appreciated by the lay mind, than the statement of visual acuity as shown with the test card with letters of various sizes.

The apparatus required for the test is much simpler, less expensive and more convenient to handle than the card of test letters. The cards of test letters used for sight testing in the schools are usually 10 by 20 or more inches in size. The broken rings for testing sight at five meters may well be printed on a card 3 inches square, or three inches in diameter. Such reduction in the size of the card greatly reduces the expense and difficulty of distributing test cards. The broken ring card can be printed and sent to any school in the United States for less than it costs to send one of the large cards of test letters. Testing the sight of school children costs very little compared with the good it does. But to reduce its cost to the minimum will certainly help to get it generally adopted.

Method of Using the International Test: The test is, to recognize the direction in which each ring is broken.

Hold the card quite close to the child, or children, and explain the test; pointing out the direction of the break in first one and then another ring; and get the child to indicate the direction by words, as "up," "down," etc., or by pointing with the finger.

Measure on the floor a line five meters long, marking each half meter. Hold the card at the distance of five meters, with a new side up. Point to one ring after another, getting the child to indicate the direction of the break in each.

If this can not be done at 5 meters step, or let the child step, one-half meter closer, and try it there. If the break in the ring still can not be seen, go another half-meter closer; and so on, until the break can be recognized in at least three-fourths of the rings.

The distance at which the break in the ring is recognized indicates the acuteness of vision. For instance; at 5 meters V. = 1; at 4½ meters V. =0.9; at 3 meters V. = 0.6; at ½ meter V. = 0.1.

Care should be taken to avoid any mark on the face of the card, by which the child may learn in what direction the card and the rings are turned. With this precaution it is impossible to learn the test, since the card may be turned in either one of four directions. It may therefore be freely shown to the children to be tested; and they should be made thoroughly familiar with it before making the test, especially the younger children.

When making the test, the card should not be placed in direct sun-light, but in the strongest light short of this obtainable indoors. The light should not be directly behind the child, where it will give a reflection from the card; but to one side, so that any reflection from the card will not come to the child's eyes.

Snellen's Test. Wolfberg[4] reminds us that if the important characteristics for recognizing the letters are called indices, *e. g.*, the gap C, without the perception of which C would be seen as O, all indices ought, according to Snellen's principle, appear under the same visual angle of 1′. Analyzing, however, the single letters, one finds aside of indices of 1′ (as in C R S), others of 2, 3

(4) Archiv f. Ophthal., p. 249, 1916.

and 5′. There are also letters (A V L T) which are recognized by their lines whose width corresponds to 7′, whose length to 5′. The indices are never smaller than 1′ and never larger than 5′, no matter whether they represent lines or intervals. Those letters of the same optometric line are read easiest which are recognized by lines of 5′ the hardest those in which the index is only 1′. The writer unites these extreme indices of Snellen's optotypes, *viz.* a line of 5′, interval and point of 1′ on an octagonal card, on the back of which is only a line of 5′. The card can be held in all different directions, so that it can not be learned by heart. The person who recognizes the point at 6 m. must also read the more difficult letters of Snellen's row 6/6, and the person who recognizes only the line, not the point at 6 m., can read only the easier types of this row. Wolfberg consequently always commences his tests with his card.

Exophthalmometric Measurements in Normal Individuals. Two hundred and forty-one eyes of male adults and fifty-nine eyes of women, with a refraction from —1 to +2 were measured and reported by H. Birnbaum.[5] The position of the eyeball was measured with the exophthalmometer of Hertel. Then the height and width of the orbital apertures were ascertained and from this the index calculated, *viz.*, the height of the orbital aperture was multiplied by 100, divided by the width. From these investigations the writer concludes that even if other elements play a part in the projection of the eyeball from the orbit, the size of the orbital aperture is the chief factor. As a rule prominent eyeballs are combined with large and oval orbital apertures, and deeply set eyeballs with small and round orbital openings.

Additional *examinations of fifty cases with Hertel's exophthalmometer* have been made by G. Schlabs.[6] He has gone into the question of the degree of exactness in millimeters that these can be made with measurements and whether physiologic fluctuations in the positions of the head can be ascertained with this apparatus.

(5) Archiv f. Ophthal., p. 378, 1916.
(6) Klin. Monatsbl. f. Augenheilk., p. 611, 1916.

He found that the exophthalmometer is for clinical observations sufficiently exact.

Lumbar Puncture and Examination of the Spinal Fluid in Affections of the Eye. The results of examination of the spinal fluid in a group of cases of interest to the neurologist and ophthalmologist and the effects of treatment in certain syphilitic cases form the subject of a practical paper by J. B. Ayer.[7] He urges the importance, to the ophthalmologist, of differentiating more carefully, by means of the spinal fluid, types of inflammatory and degenerative disease of the nervous system.

The paper is based in the examination of 160 cases. The cases studied were external ocular palsies, primary optic atrophy, optic neuritis and choked disk, and abnormal pupils. Of forty cases of external ocular palsies, only five showed normal spinal fluids; of forty-four patients with primary optic atrophy twelve showed normal spinal fluid and four of these had previously had antisyphilitic treatment. Lumbar puncture was done in ten cases of choked disc and five showed lues; in three other cases lumbar puncture was not done but the Wassermann was positive. In regard to the Argyll Robertson pupil, the author emphasizes the importance of tests of the spinal fluid in determining the stage of the disease.

HYGIENE OF THE EYE.

Writing for the Blind. The advantage of the method described by Cantonnet[8] is that it can be read by those who see as well as by the blind. The letters are punched dots, but they are arranged in the shape of the ordinary capitals and are thus easily read by anyone. They are punched through a tin ruler which has two rows of slits arranged in groups of three, and the dots are punched through these slits. The letter H, for example, is made with three dots in each of the outer slits and one dot in the center of the middle slit. If a carbon paper is placed under the writing paper, the punched through dots show up plainer. They can be read from the dots or

(7) Archiv. Ophthal., Vol. 45, 1916.
(8) Bull. de l'acad. de méd., April 3, 1917.

by holding the back of the paper in front of a mirror. Samples of the writing are given, and an illustration of the tin ruler with its two rows of sixteen groups of slits; thirty-two letters can thus be written before the ruler has to be moved down. The method does not compete with the Braille, but supplements it by providing a means of communication with the seeing.

Eskimo Snow Blindness and Protective Goggles. After visiting among 3,000 Eskimos, J. Daland[9] comes to the following conclusions: The Eskimo possesses no immunity from snow blindness; snow blindness occurs on cloudy days or dark days as well as on sunny days; one attack of snow blindness predisposes to another; snow blindness occurs in animals; there is decided evidence of the excellence of the snow goggles invented by a primitive people in preventing snow blindness; there is an association of conjunctivitis and corneal erosions with chorioretinitis in snow blindness; the ultraviolet ray causes conjunctivitis, corneal erosions, and possibly chorioretinitis.

The Education of Ophthalmic Surgeons. Not only teachers of ophthalmology, but ophthalmologists in general should read all of the practical essay on this subject by Freeland Fergus.[10] What he says of ophthalmic practice in Great Britain is largely true of this country. He points out that as things are at present, any one who has money enough to buy a set of trial lenses can start in practice and call himself an ophthalmic specialist. Fergus has no wish to limit the practice of anybody, but for many years he has thought that ophthalmic surgeons should be specially trained, just as dentists are, and this has become all the more urgent because the state is now very properly insisting on ophthalmic work being done in schools and in other departments of public life.

We should insist, Fergus says, upon every ophthalmic student knowing several parts of elementary mathematics, with which the ordinary medical student is often unacquainted. Thus, he certainly should have a good working knowledge of plane trigonometry to the solu-

(9) Ophthal. Record, March, 1917.
(10) Ophthal. Review, January, 1916.

tion of triangles, and he ought also to know logarithmic arithmetic. Without these he will not be able to study angles of squint and deviations. Then he ought also to know the use of rectangular co-ordinates. In teaching, Fergus invariably explains the phenomena of diplopia in terms of ordinary rectangular co-ordinates, and finds that junior students, after it is explained to them, grasp the facts much more easily in that way than in any other. Perimeter tracings, moreover, are an example of polar co-ordinates. He thinks it is desirable, although perhaps not necessary, that a student who is going to be a specialist in ophthalmology should know the elements of the differential calculus.

As regards professional education no man should be allowed to begin ophthalmic practice without a medical qualification. The majority of dentists may begin their work without that, but ophthalmology is so intimately related to many pathologic conditions which are systemic and not local that he would not allow a man to practice ophthalmology who had not obtained the ordinary M.B. degree or something equivalent. Further, an ophthalmic practitioner ought to know the technique of modern surgery.

Fergus would look on a special ophthalmic qualification as an extension of the medical curriculum, and in this respect it would be very much like a public health qualification; it must be equally thorough. To begin with, there are certain parts of anatomy which ought to be more fully studied than they are by the ordinary medical student. He would also lay special stress on the anatomic arrangement of the contents of the orbit, the exact position of the several muscles, the various ligaments supporting the eyeball and also checking the action of the muscles, which ligaments are not mentioned, so far as he has observed, in the ordinary text-books of anatomy. Then the histology of the eyeball itself and the lymphatics draining it are of great importance; considerable new light has been thrown on that subject quite recently. The nerve arrangements to control the action of the external and internal muscles and giving the presence or absence of binocular vision are immensely important. The student, moreover, should have

a fairly good knowledge of the anatomy of the brain, and especially of those parts connected with vision, for that information will help him greatly in the work of localization.

In the second place, there ought to be a special course of physiology. The subjects which this should take in are very numerous; the whole phenomena of color perception, of light perception, of binocular vision, of the field of fixation and field of vision should be discussed in a special physiologic course arranged for ophthalmic students, and along with this there should be a certain amount of laboratory instruction.

Fergus regards as of primary importance the subject of physics. He spent three years in a physical laboratory working at light, and although perhaps this was an excess of zeal, he found that it has served him in good stead ever since. The ordinary course for a medical student who is going to be an ophthalmic practitioner should be extended from three months to six months, and there ought certainly to be laboratory practice. In addition to that, the ophthalmic student should take a good course in geometric and physical optics, also accompanied with laboratory work. He ought to have a thorough knowledge of the properties of lenses, of mirrors and of prisms. He should have a working acquaintance with the spectrometer, the spectroscope and the optical bench, and he also ought to be familiar with the various methods of calculating indices of refraction. Without knowledge of this kind a man can not even read the standard books on ophthalmology, such as that of Helmholtz, and without it he can never be anything more than a rule-of-thumb practitioner.

These courses should be arranged by the professor of physics, and the laboratory work done under his supervision. Fergus thinks there might be a reasonable arrangement between the student and the teacher of ophthalmology as to the extent and scope of the courses. It is also quite clear that the would-be ophthalmic practitioner should have a good working knowledge of bacteriology, especially of conjunctival bacteriology. If, during his medical studies he has acquired that knowledge Fergus perhaps would allow him to forego any fur-

ther instruction provided he showed himself efficient; but he would allow no man now to practice ophthalmology who has not a thoroughly good working knowledge of conjunctival bacteriology. Almost every case of conjunctivitis that comes into his clinic is examined bacteriologically either by him or by his chief assistant, and he is glad to know that his introduction into ophthalmic practice of the bacteriologic testing of eyes before operation has been of enormous benefit to ophthalmic patients.

As regards the strictly professional part of ophthalmic work Fergus would make the student, in addition to attending some advanced lectures, attend for at least two years an ophthalmic clinic, taking care that the man who conducts that clinic is himself fairly conversant with the modern scientific side of ophthalmology. There ought to be an abundance of clinical material, for he has found during years of experience that the proportion of cases suitable for higher instruction of students is limited. A very few weeks will teach a student the ordinary run of practice, and will teach him to recognize the ordinary external conditions; but those cases which are of special interest in the higher parts of ophthalmology are, comparatively speaking, rare, if we except errors of refraction, which, of course, are very common. We do not frequently see cases of diplopia nor persons affected with diminished range of convergence or diminished range of latent convergence, or defective light sense. If a clinic is to be used for ophthalmic instruction it must of necessity be a very large one, so that on the average a fair number of suitable cases may be available for instruction.

In teaching elementary students almost anything will do. For the first six weeks of their course almost any patient can be used for the instruction of students, but certainly most of them are quite unsuited for advanced teaching. On the average, if we get about two patients, out of about thirty or forty, suitable for higher work, we have done fairly well. A small clinic would simply mean that higher teaching would dwindle down into the hearing of lectures and not into actual work; and that, of all things, is to be deplored. It is no good taking

students and placing them on benches and telling them that the patient has this, that or the other thing; the only way in which a teacher can get students to learn ophthalmology is by making them in a painstaking way examine patients for themselves. That all along has been the Fergus method. He has taught entirely by making students from the very first investigate cases, helping them on the subject when they come to a standstill. That is clinical work. Placing students on benches and showing a patient at a distance of a classroom with a small something wrong with his eye and telling them what it is will not make ophthalmic surgeons. A student from the moment he enters Fergus' clinic is made to take fields of vision and visual acuteness and to examine and report on eyes. At first, of course, he does it very badly, but before the session is done the elementary student can quite clearly recognize the ordinary lesions, and, for years, Fergus has not had a student leave his clinic unable to use an ophthalmoscope, and, roughly, to diagnose an error of refraction.

Moreover, some parts of the modern subject of experimental psychology should undoubtedly be studied in an ophthalmic course. The psychologists have done an enormous amount of important work on the investigation of the color sense and light sense. These researches are by no means of purely academic importance, but of great value from a practical and clinical point of view. In how very few clinics is the light sense ever examined, and yet by neglecting it the practitioner often deprives himself of useful information.

The training necessary for an ophthalmic specialist ought to last for about three years, and the names of those who have taken the special course should be placed on a special register.

Fergus would not for a moment prevent anyone who has a medical qualification from practicing ophthalmology. The old system, or rather want of system, has produced very many eminent and good men. Mackenzie, Bowman, Nettleship and Argyll Robertson were all men of the first rank, born, not made. At the same time, every man who has money enough to buy a trial case is not necessarily a genius, and the above suggestions if

carried out would distinguish those who have had a specialist's training from those who have not.

Color Vision.

Color Interlacing and Perimetry. In an article that should be read in the original and which the editor regrets he cannot properly review here, Clifford B.

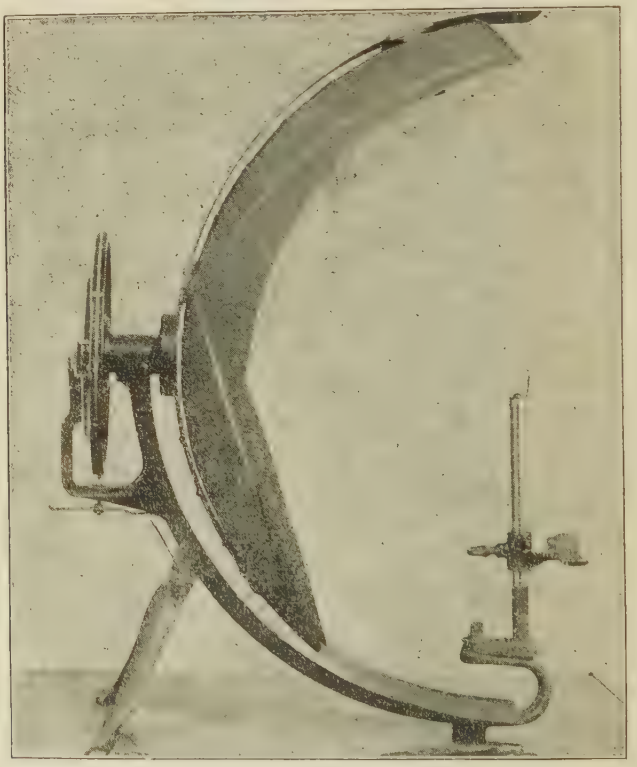


Fig. 3. Disc Series and Equivalents.

Walker[9] describes a number of instruments and devices for accurate perimetry.

Most of the figures (illustrating the paper) reprinted here are self-explanatory (Figs. 3 to 7, and Plate I.).

(9) Ophthalmology, October, 1916.

Special specimen of Fig. 1) mounted on suspension apparatus and artificially illuminated by tungsten lamps (right at work and right at rest) alternately placed and connected from switchboard shown at ... Walker (see page 241).

The writer concludes that for the detection of early pressure effects on the optic tract examination of the fields for the smallest visual angles gives the most reliable results: also, that color interlacing is not a reliable test for cerebral pressure. Most of the color interlacing found in the past in brain cases may be accounted for by a variety of variables, largely psychologic, physical and mechanical. Perimetry on semi-reclining patients by artificial illumination imitating daylight has been found practical.

The Classification of the Color-Blind. This important subject has been much discussed in recent years and

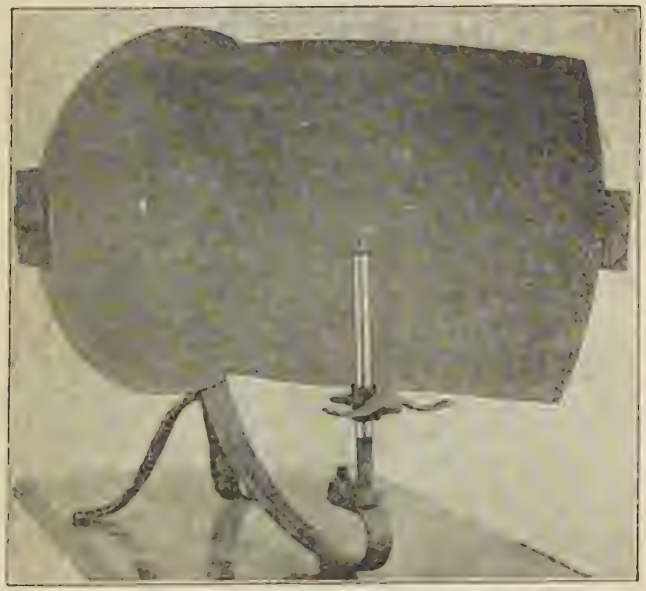


Fig. 1. Special Perimeter with Wide Movable Face—Walker
(See page 24.)

F. W. Edridge-Green[1] claims that he has formulated a satisfactory list of the color-blind mainly through the theory of color vision which he adopted.

This color theory is briefly as follows:

(1) Ophthal. Review, January, 1916.

Fig. 5. Disc Carrier and Color Interchanger.—Walker. (See page 24.)

A ray of light impinging on the retina liberates the visual purple from the rods and a photograph is formed. The rods are concerned only with the formation and distribution of the visual purple, not with the conveyance of light impulses to the brain. The ends of the cones are stimulated through the photo-chemical decomposition of the visual purple by light, and a visual impulse is set up which is conveyed through the optic nerve fibers to the brain. The character of the stimulus and impulse differs according to the wave-length of the light causing it. In the impulse itself we have the physiologic basis of the sensation of light, and in the quality of the impulse the physiologic basis of the sensation of color. The impulse being conveyed along the optic nerve to the brain stimulates the visual center, causing a sensation of light, and then passing on to the color-perceiving center causes a sensation of color. But, though the impulses vary in character according to the wave-length of the light causing them, the retino-cerebral apparatus is not able to distinguish between the character of adjacent stimuli, not being sufficiently developed for the purpose. At most seven distinct colors are seen in the spectrum, while others see in proportion to the development of their color-perceiving centers only, six, five, four, three, two, or none. This causes color-blindness, the person seeing only two or three colors instead of the normal six, putting colors together as alike which are seen by the normal-sighted to be different. In the degree of color-blindness, just preceding total, only the colors at the extremes of the spectrum are recognized as different, the remainder of the spectrum appearing grey.

It is obvious that this theory could not be true if the

facts of color-vision were as stated in the books of twenty-five years ago. Apart from the relative functions of the rods and cones, if color-vision were a secondarily developed power of discrimination then the following should be facts:

Fig. 6. Combination Blinder and Macula Selector.—Walker.
(See page 24.)

There should be innumerable varieties of color discrimination which could be arranged in a series from total color-blindness to super-normal color-vision.

The number of colors seen in the spectrum should depend on the development of color discrimination, those colors presenting the greatest physiologic difference being the first to be discriminated.

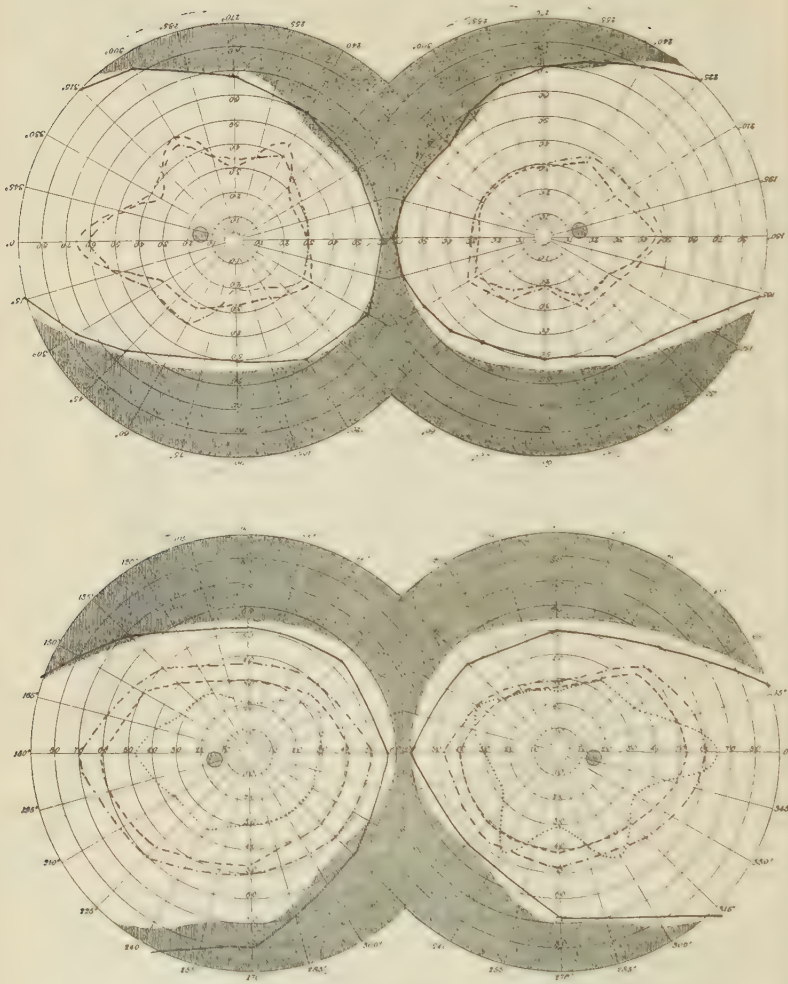


Fig. 7. Fields taken before and after decompression, illustrating shrinkage of red fields at points of interlacing, present in right eye only. The dotted lines (....) indicate red field before operation transposed onto field after operation.—Walker. (See page 24.)

The physiologic difference would probably correspond roughly to the physical difference; that is to say, the largest and smallest waves would be the first to be differentiated.

Yellow should be a simple but secondary sensation.

A pure spectrum should be divisible into a series of monochromatic areas, the size of these areas depending upon the development of color discrimination.

There should be defects of light perception distinct from defects of color perception. Shortening of the red or violet end of the spectrum should be distinct defects and not necessarily associated with defective color discrimination.

There should be innumerable varieties of dichromic vision.

There should be trichromic cases of defective color perception, three colors being seen in the bright spectrum, yellow being seen as red-green, and blue as green-violet.

All colors when reduced sufficiently in luminosity and area should appear white, the color disappearing first in the least developed portions of the retina.

Simultaneous and successive contrast should be increased in those with defective color discrimination.

Those with defective color discrimination should see like those with better discrimination in conditions of more difficulty.

REFRACTION.

Late Results of Operative Treatment of High Myopia. An interesting review of fifteen of these cases is given by A. Hugh Thompson.[2] The writer says that there was a great preponderance of females to males which he attributes partly to accidental causes, and partly to a real preponderance of high myopia in the female sex.

With regard to the condition of these eyes several years after the lens had been removed two-thirds of those operated on had after an average period of eight years, materially better vision than they had before

(2) Ophthal. Review, January, 1916.

operation; and nine out of ten of these eyes obtained vision of 6/24, 6/18, or 6/12 without wearing any glass at all. It is to be noted that in one of these successful cases macular changes have occurred in the unoperated, but not in the operated eye. In another a macular hemorrhage occurred eight months after operation in the operated eye, but this cleared up completely, leaving good vision (6/12) eight years after operation.

In five cases—*i. e.*, in one-third of those operated on—the eyes have gone more or less wrong after enjoying good sight for varying periods up to ten years. In three out of the five the cause was macular degeneration, such as is apt to occur in highly myopic eyes, whether operated on or not. In two of the three the macular degeneration was binocular—*i. e.*, it occurred in the unoperated and operated eyes alike. In the third case the unoperated eye was only myopic to a comparatively small extent(—5 D.), so that it was not equally liable with the operated eye to this disaster. Further experience therefore confirms the conclusion arrived at by Thompson five years before, that the most common disaster which highly myopic eyes are liable to is macular disease, either degenerative, inflammatory or hemorrhagic, and that the fact that they have or have not been operated on makes no difference to this liability. The remaining two patients who now enjoy but poor vision are of some interest. One for some years after the first operation enjoyed fairly good vision, so that she was able to do her work as a domestic servant without glasses. Four and a half years after the first operation she came again to the hospital with synechiae binding the pupil all round to the remains of the lens capsule and a thin membrane covering the pupil. This membrane was easily needled, but every time it was done it formed again, so that the latest vision of the eye was only 6/60. The writer attributes this unsuccessful issue to the evil effects of pyorrhea alveolaris.

The Scissors Movement in Retinoscopy. The skiascopic incident known by this name is due to a form of irregular astigmatism and is of sufficiently frequent occurrence in retinoscopy to warrant further description and methods of handling such cases refractively

than are given in our text-books. In general terms, the shadow is split into two portions which, as the mirror is rotated, advance from opposite sides of the pupil and merge into one band giving the effect of closing a pair of scissors. On rotation of the mirror in the direction the reverse of that first employed the two oppositely moving reflexes again appear distinct and separate with a dark space intervening. Charles Sheard[3] maintains that uncertainty exists as to the cause of this phenome-

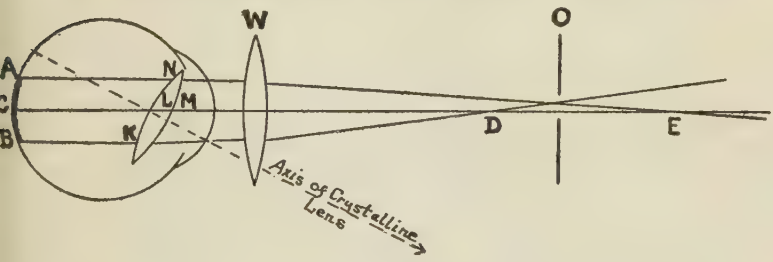


Fig. 8. Showing Mechanism of Scissors Movement.

non but it has probably been properly attributed, in general, to ectasia cornea and slight tilting of the lens. In this latter condition the anterior-posterior axis of the lens is not at right angles to the plane of the cornea. This tilted lens would cause one portion of the skiametric reflex to act myopically (light area moving against motion of plane mirror) and the other portion hyperopically. Scissors movement may therefore be due to coma on account of the obliquity of one or more surfaces of the dioptric media to the path of the incident light. This hypothesis is in part substantiated by the following facts: (1) in an eye having a normal reflex by direct illumination, the scissor movement may be obtained by directing the beam of light obliquely; (2) a tilted spherical lens, especially if of fairly high power, in front of an eye may produce such an effect; (3) the effect can be artificially produced with schematic eyes by the use of obliquely directed light, and (4) by a combination of lenses, in bifocal form or character, giving for ex-

(3) Ophthal. Record, August, 1916.

ample an effect of —3.00 D. in upper portion and +3.00 D. in lower portion placed before a schematic eye set in emmetropic condition as described by James Thorington.

Coma is aberration produced by the unequal refracting effects of different parts of the various meridians of the eye, or lens, on oblique pencils of light. It is, in brief, spherical aberration for oblique light; if this condition is produced optically we do not get a point

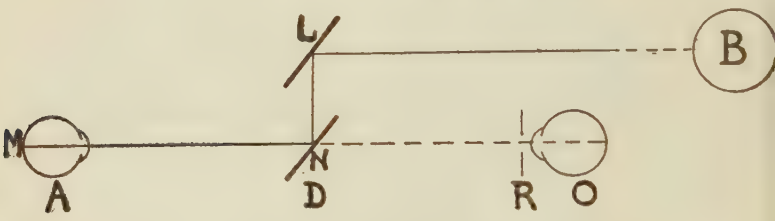


Fig. 9. Method of Eliminating Scissor Movement.

image of a point object but rather a confusion disc which is non-symmetrical. In Figure 8 let L represent the crystalline lens in an oblique position. Assume that light has been thrown from the retinoscopic mirror into the eye; let A B represent the retinal area of illumination. The working distance lens is represented by W; for example 1 D. for 1 meter. We are interested solely in the retinal reflexes or illumination returning to the observer assumed stationed at O. Let rays A N and B K be parallel rays of light emanating from the retinal area; the ray C M D E is the oblique principal axis. The ray B K reaches the surface of the lens sooner than the ray A N, and since B K departs more from minimum deviation than does A N (since the lens L may be considered as consisting of an infinite number of prisms) the emergent ray K D cuts the axial ray C E at D sooner or ahead of the emergent ray N E which cuts the axial ray at E. With the observer's eye at O we see from the diagram that it is possible (1) for the two reflexes, one myopic and one hyperopic, to be made to occupy one and the same position and (2) on motion

of the mirror, since D is in front of the observer's nodal point and E is behind it, there will arise with and against movements or shadows.

Without doubt scissors motion may arise due to the obliquity of the light incident upon the eye under test. In the ordinary methods of procedure the patient is directed to look past the operator's ear and vaguely into space or at an illuminated test-type. A much better procedure and one which eliminates quite frequently these scissors movements, which are in these cases false

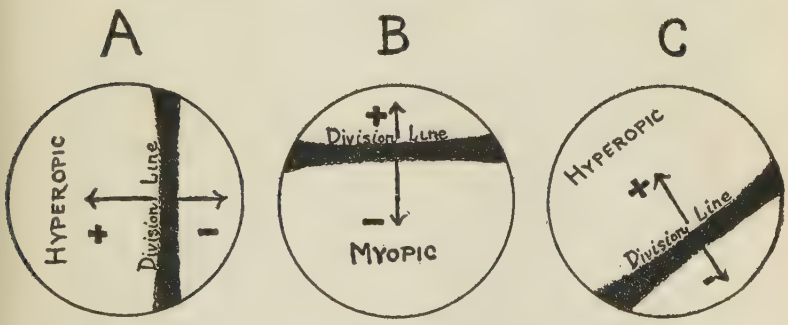


Fig. 10. Showing Position of Scissor Bands.

in the sense that they are due to physical rather than anatomic reasons, has been devised by John C. Eberhardt, of Dayton, Ohio. Not only does this device do away with the liability to the above mentioned effects but it also insures the operator that the refraction at or near the macular area is being made retinoscopically which is a most important consideration. The device is diagrammatically shown in Figure 9. The macular reflectoscope is represented at D and consists of two parallel, plane mirrors, L and N, mounted on a suitable stand and so placed before the eye of the person being examined as to enable an illuminated 80 or 100-foot letter (B) at 20 feet to be seen or at least fixed upon by the eye A in its primary fixation position due to the double reflection of light by the mirrors L and N placed at an angle of about 45° with the line of sight. The oper-

ator O, with retinoscope at R, may then proceed to the skiametric refraction of the eye in its *direct line of sight.*

It is essential that the retinoscopic refraction of such cases be made as nearly as possible in the direct line of sight; this is possible by the use of a device such as the so-called macular reflectoscope previously referred to or by dynamic skiametry. In this latter method fixation is elicited for a letter or set of letters or points on a card attached close to the mirror of the retinoscope; a neutralization skiascopically of one meridian by a sphere then leaves the opposite meridian to be corrected with cylinders, hence making it possible to determine the cylindrical element correctly irrespective of the operator's opinion as to the refractive accuracy of the spherical element found. When an eye is under complete cycloplegia these methods are still applicable although, of course, the dynamic method is not dynamic but simply serves as a method of directing the patient's gaze; under cycloplegics the refraction in the line of sight can be accomplished very readily except for the disadvantage of peripheral rays which add to the already complicated problem. The general mode of procedure is, then, to neutralize the motion in the meridian opposite to that in which the scissors movement arises, keeping the two bands together as is advocated by Thorington. Having neutralized this meridian with spheres, Sheard then proceeds to the correction of the meridian in which the scissor movement has evidenced itself in the following manner: the two bands are brought together and the position of the line of union into a single band in the pupil is noted, *i. e.*, whether, as it forms, it is the nasal, temporal, supra or infra side. The mirror is then rotated in the opposite direction slowly and the positions of the two bands just at their line of separation are noted and *that portion of the double reflex which contains within itself the center of the pupil,* or which in any way gives evidence that it discloses the chiefly usable portion of the eye, is corrected with cylinders (Fig. 10). In case of doubt as to which shadow to heed, since the line of demarcation may arise near the pupillary center, Sheard has found

it, in general proper, procedure to neutralize the nasal or the infra portions respectively. The greater percentage of cases show the scissors bands lying at or near the 180° line of the trial frame, but some few cases, particularly those giving a history of traumatism in the temporal region, exhibit these bands at or near the 90° point.

In conclusion, Cowper contends for: (1) The desirability of and necessity for obtaining the retinoscopic findings as nearly as possible in the direct line of sight. Many scissors movements will not then evidence themselves although present under oblique examination. (2) When a scissors movement arises, determine the position of the single band just as the two bands close together and again the position of the division line just as the two bands re-appear; correct retinoscopically by the addition of cylinders to the lens quantity already present the astigmatic band which contains within itself the center of the pupil or which gives evidence that it discloses the chiefly usable portion of the eye. (3) In cases of doubt correct retinoscopically the nasal or the lower (infra) portion of the double reflex respectively and subject to rigid subjective testings. (4) A slight over-correction of the meridian first corrected may either do away with the scissors movement or aid in the determination of which portion thereof is to be corrected. (5) The use of a narrow stenopaic slit in such cases is a valuable corroborative test.

Symptoms Noted in Two Thousand Cases of Refraction, Above Eight and Under Forty Years of Age. A very practical essay with this title is from the pen of John F. Woodward.[4] He regards frontal headache as the chief symptom of hyperopic astigmia, sometimes noticed, also, in a high grade of nervousness. The "squinting" patient will usually show hyperopic or myopic (high grade) astigmia with regular or irregular axis. These patients are much given to blepharitis and photophobia. When muscle imbalance is found, supra-orbital headache and vertigo are also often present.

Simple myopic astigmia in all of its phases gives

(4) Virginia Med. Semi-Monthly, May, 1916.

about the same symptoms as simple hyperopic astigmia. The vision is not quite as good, perhaps, and the symptoms seem more acute. Inability to open the eyes wide, or the "squinting" eyes are very common in this trouble in high grade.

In compound hyperopic astigmia, ocular, frontal and supra-orbital pains start in the eye, radiate backward, and are not isolated as in hypermetropia. When the astigmia is irregular nuchal, or "check-rein" pull, blepharitis, nervousness, hot, bulging feeling and inability to use the eyes are complained of. If imbalance complicates the ametropia these symptoms are increased, and vertigo is often found if hyperphoria predominates. Chronic conjunctivitis is often seen, with the line of irritation corresponding to the palpebral slit. However, the combined frontal and supra-orbital headache with the nuchal "pull" are the most pronounced symptoms.

The different forms of compound myopic astigmia show poor vision, and the symptoms are similar to those of compound hyperopic astigmia. Though this combined frontal and supra-orbital symptom is not so constant as in the hyperopic, the writer found vertigo more common when the imbalance is hyperphoric.

In mixed astigmia the supra-orbital and nuchal pain are certainly diagnostic. It is not so marked in the regular form. In irregular astigmia accompanied by imbalance the headache, palpebral irritation, nervousness, photophobia and eye fatigue are usually marked.

Frontal and supra-orbital headache, when unilateral, are diagnostic of anisometropia. Rapid eye fatigue, diplopia, blurring of vision, bad vision in one eye and high degrees of imbalance, are usually found in this condition. Photophobia and palpebral irritation are uncommon.

Woodward has seen nervous conditions following very high degrees of hyperopia, but mixed astigmia and the different varieties of hyperopic astigmia give the highest percentage of nervous manifestations. The profession at large is inclined to minimize the importance of searching for psychoses among ametropes. Headache is only a symptom, and, like neuralgia, it has been a mantle of charity in apologizing for ignorance; "chron-

ic stomach headache'' is a fetish of the past beyond the possibility of a decent explanation. Quacks are growing fat and impudent upon the victims of such ignorance. The writer is not foolish enough to think that every headache, every nervous spell, every migraine, or every *petit mal* is caused by errors of refraction, but he does believe that when one has studied a case of chronic headache carefully, it is a crime to continue to punish the liver and the stomach and fill private and public hospitals with tilting wombs and offending ovaries.

Nausea he considers a negligible quantity in errors of refraction, as he has seen it so seldom.

Vertigo, however, is of great importance. Several of the patients examined suffered greatly from car sickness (trolley and railway). In every instance there was regular or irregular astigmia with hyperphoria, and frequently one of the other phorias was present.

Palpebral irritation and photophobia were found most frequently in the irregular astigmias.

Simple errors of every kind give most persistent eye discomfort. There were six patients on the list who had astigmatism ranging from 3.50 D. to 6 D., with irregular axis, without ever having complained of headache. But they were all backward in their school work, and thought to be subnormal children. After correction their parents remarked upon their improvement in school work.

It may be true that children, who are ever ready for play, do not complain as often of headaches, but their physical and nervous systems particularly will eventually show the results of eye-strain.

Few children after the age of eight or nine had refractive errors that underwent material change. That it will happen is a fact, nevertheless; the writer also saw, however, equally as many adults in whom the astigmatic axis has changed from year to year. After muscle corrections, there is often decided change in the astigmatism. Perhaps change of occupation or closer application of eyes to book work may be the cause in those in whom such changes are found.

DISEASES OF THE EYELIDS.

Extensive Symblepharon. This condition, so unsatisfactory, from the operative standpoint, is discussed by Frederick Krauss,[5] who proposes an improvement on the usual procedures.

In the following description, the bulbar defect is covered in part by conjunctival flaps and the palpebral portion by a skin flap. Much difficulty is found in retaining the flaps in the position desired. Suturing is unsatisfactory, lead plates are equally so. Krauss found the use of the elevator pulley suture, to be described, very satisfactory in that it holds the lower lid on the stretch, permitting a larger flap to be used on the inner

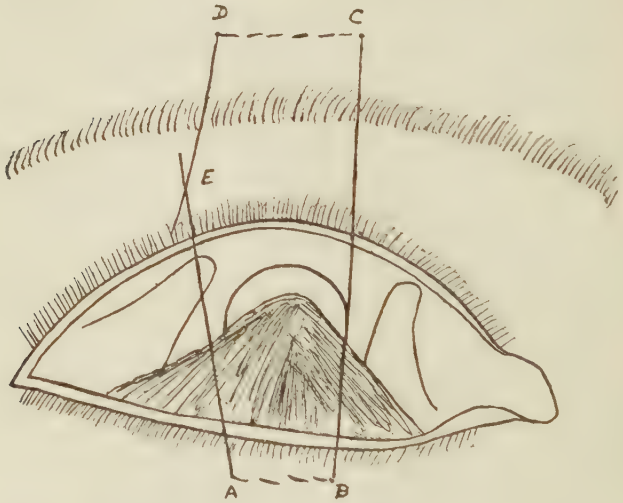


Fig. 11. Conjunctival Flaps and Stay-Suture.

surface of the lid with good apposition against the globe and lastly assists in the formation of a deep sulcus, from which the flap does not tend to work out.

The writer illustrates his method by the history of a patient, 25 years old, who was severely burned in the

(5) Ophthal. Record, July, 1916.

right eye, neck and chest by molten steel five months previously. He presented an extensive symblepharon completely blocking the lower cul-de-sac, except a small area on each side. The cornea through two-thirds of its extent was covered by a thick fleshy mass continuous with the lower lid. There were several smaller synechiae in the upper cul-de-sac. The cornea was hazy throughout allowing only light perception. The eye was uncomfortable as well as unsightly.

The thick pterygium-like mass was carefully dissected from the cornea and from the eyeball to the depth of the

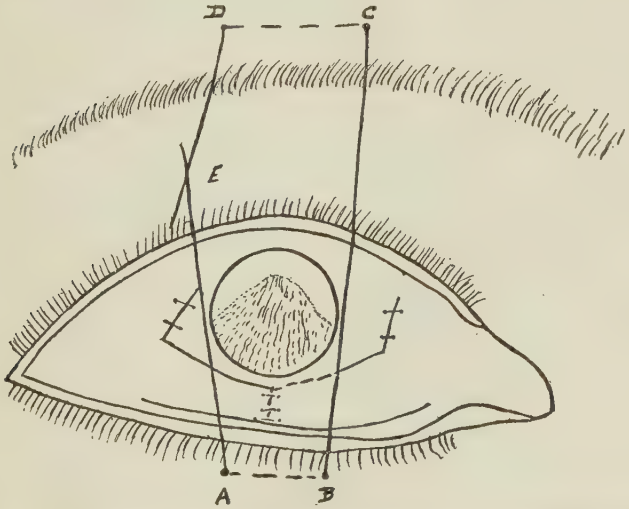


Fig. 12. Operation for Extensive Symblepharon. Flaps Stitched in Position.

normal cul-de-sac. In the course of this dissection, small isolated areas of conjunctiva were discovered and saved.

A large flap of conjunctiva was loosened on the inner and outer sides of the eyeball. These were necessarily rather short, but were united to cover the eyeball by means of sutures. The bottom of the cul-de-sac and the palpebral wall were covered with a Wolff graft, taken from behind the ear.

The flap was readily retained in position by a skin suture inserted near the center of the upper part of the lower lid, brought out about 5/8 inch away, carried up to the forehead where it was similarly introduced, tying the ends over a piece of gauze (Figs. 11 and 12). The suture acts as a pulley, allowing as much elevation of the lower lid as may be desired. The graft is pressed between the eyeball and the lower lid and held securely, by the large piece of gauze covering the eyeball over which the above named suture is tied.

The suture in this case was removed in five days, leaving no trace. The healing was excellent and a good cosmetic result was obtained.

In the illustrations the needle is introduced at A, brought out at B, carried to C, introduced and brought out at D. When tying the suture at E the lid can be elevated to the position desired, and at the same time the large piece of gauze over which it is tied holds the eyeball quiet, allowing time for healing.

[The Editor has seen what to him has been an unusual number of obliterated palpebral sulci, cicatricial orbits and total symblephara during the past year, and he is more impressed than ever with the operative difficulties to be overcome in relieving these obstinate cases. Although the Weeks and Hotz-May operations seem to meet the requirements of the majority, yet every surgeon will welcome any new procedure calculated to afford further relief.—Ed.]

Chalazion Treated by Plantanus Occidentalis. This drug was, by W. H. Williams,[6] given internally in from one to three drop doses [of the tincture?—Ed.] about two or three times daily for the absorption of chalazion. He reports five cases, two in young children and three in adults. The chalazia in the children disappeared after the drug had been used for several months. In adults its use had apparently but little if any effect.

[We would suggest to the experimenter that his ill-success with adult patients was due to the fact that the "yarb" was not collected—as it ought to have been—by the pale light of the moon!—Ed.]

(6) Jour. Ophthal., Otol. and Laryngol., March, 1916.

PLATE II.

Blepharochalasis. Much magnified picture. Shows characteristic tissue-paper-like wrinkling in the skin of the upper lids. Randolph (see page 11).

PLATE III.

Diagram of Roberts's "muscle substitution" operation for congenital ptosis by transferring fibres of occipito-frontalis. Operation performed March 29, 1916, on Arabella S—. Small diagram shows method if flap turned downwards and outwards instead of upwards and outwards.—Roberts (see page 41).

Blepharochalasis—A Variety of Dermatolysis. R. L. Randolph[8] reports a case in a girl, aged 15, who has had since birth an unusual condition of the upper lids, consisting in considerable looseness of the skin and thinness of the connective tissue in this situation (Plate II). One can also notice lichen-like changes in the lids, which no doubt account for the periodic attacks of itching which occur from time to time and which provoke a great deal of scratching and consequent swelling of the lids. For weeks at a time, however, the relaxation of the skin is the only trouble present. This relaxation; atony, or dermatolysis, or, as Fuchs suggests, blepharochalasis, is a very rare disease, and only a few cases have found their way into literature. According to Fuchs, the trouble is always bilateral. The skin, owing to its loss of elasticity and thinning, is thrown into countless folds criss-cross in all directions, such as one sees in advanced senile atrophy and relaxation of the skin, and, as Fuchs describes it, presents a tissue-paper-like appearance. Very frequently there are, at the most convex point on the lids, numerous small dilated veins, such as one sees in elderly persons with red cheeks. There is no hypersensitiveness of the skin. The changes, as will be seen, are pronounced between the eyebrow and the upper edge of the lid. In conclusion, it should be said that the disease is one of early childhood, starting at puberty. The author states, however, that, so far as he can learn from the mother, this child has had it from earliest childhood. The accompanying photograph shows well the condition described (Plate II).

A New "Muscle Substitution" Operation for Congenital Ptosis. This operation is described by John B. Roberts.[9] The eyebrow was shaved and an incision carried from the root of the nose along the superciliary ridge almost to the external angle of the frontal bone. From the nasal extremity of this cut a vertical incision was made through the tissues of the forehead almost to the hair line. The flap was turned upward and outward so as to expose the occipito-frontal muscle and tendon. Just beneath the upper orbital margin an incision down

(8) Ophthal. Record, December, 1916.
(9) Ophthal. Record, August, 1916.

to the fascia of the upper lid was made from the nasal to the temporal side following the curve of the bone. This skin flap was turned downward, the tarsal plate exposed and its upper edge identified. A tunnel was then cut beneath the soft tissues about half an inch in width extending under the orbicular muscle to the incision made through the shaved eyebrow.

From the muscular belly of the occipito-frontal muscle immediately above the tunnel opening was cut a strip of muscular fibers about a third of an inch wide and an inch and a quarter long. The parallel incisions making this strip diverged a little at their upper ends so as to make the muscular band wider near its upper extremity. A cross incision was made at the upper end converting the muscular strip into a long flap (Plate III).

This flap was turned downward, thrust through the tunnel and attached to and upon the upper edge of the tarsal plate by three silk sutures. The two corner sutures were put in as mattress stitches and held the flap on top of, that is superficially to, the tarsal fibrous plate. Returning to the frontal region, Roberts cut on each side of the turned down flap two strips, each half the width of the inverted flap, having their only attachment to the muscle above. These were drawn toward the fold of the inverted flap, attached to it on its superficial surface, which formerly had been the under surface, by a mattress suture at each edge and were united in the middle line by a third suture, also put through the turned-over portion of flap so as to make a mattress suture. An additional suture was inserted at one edge where the first flap was bent over, to keep it thus folded. The superficial skin flap of the forehead was then replaced and sutured in position by silkworm-gut sutures. Subsequently the Berger operation with arrow-head excision on each side, was performed for the epicanthus. The sutures were so placed as to lift a little the inner canthus of each eye. The wounds all healed by first intention. A satisfactory result in addition to the child's ability to raise the eyelid has been that the operation makes a normal furrow in the lid at the seat of the upper edge of the tarsal plate. This is conspicuously absent in severe cases of congenital ptosis. The result at present

is excellent, though the time since operation has only been about two and one-half months.

DISEASES OF THE CONJUNCTIVA.

Purulent Conjunctivitis in Infants Under Two Months of Age. An important investigation of infantile conjunctivitis has been carried out by A. W. Williams and C. Rosenberg[1] under the auspices of the Bureau of Laboratories of the New York City Health Department in order to determine the present incidence, causes, and results of purulent conjunctivitis in infants under two months of age. Examinations were made of the eyes of 1,000 consecutive births, with the following results:

(1) In a thousand consecutive births only 0.8 per cent. had purulent conjunctivitis. (2) In ten cases out of forty-seven cultured cases or in 21.2 per cent. only staphylococcus or staphylococcus and the xerosis bacillus were found, but not in large enough numbers to be considered a cause. (3) In twelve of these cultured cases, or in 25.5 per cent., the gonococcus was found. In nine of these twelve cases, or in 19.1 per cent. only, of all the cases, was the gonococcus found without the presence of either the streptococcus-pneumococcus group or the influenza group of organisms. In three of these twelve cases, or in 6.3 per cent. of all the cases, the gonococcus was associated with either or both the streptococcus-pneumococcus and the influenza groups. (4) In twenty-two out of forty-seven cultured cases, or in 46.3 per cent. of all the cases, was the streptococcus-pneumococcus group of organisms found independent of the presence of the gonococcus and the influenza bacillus. It was thus found to be apparently about twice as often a cause of purulent conjunctivitis as the gonococcus. (5) In twelve cases, or in 25.5 per cent. (the same number of times as gonorrheal infection), was the influenza bacillus group found as the apparent exciting cause. (6) A history of 77 per cent. of cases positively receiving prophylactic treatment, and of a probably greater percent-

(1) Archiv. Ophthal., March, 1916.

age having received it, suggests the advisability of treatment on the second day with silver nitrate solution. (7) In only three cases was the cornea involved. The fact that these three cases were gonorrheal infections confirm the opinion that cases of purulent conjunctivitis which are infected with this organism are liable to be more severe in infants than those due to other infections. (8) Purulent conjunctivitis in infants is due, in one-third of the cases at least, to organisms other than the gonococcus. (9) The fact that purulent conjunctivitis or ophthalmia neonatorum does not always mean an infection with the gonococcus should make physicians more ready to report such cases to the Health Department.

Conjunctivitis Tularensis.[2] A recent report on the so-called Squirrel-Plague Conjunctivitis is from the pen of Frederick W. Lamb.[3] The first case of this extremely rare disease was reported by D. T. Vail, and abstracted for the 1915 volume of this *Series* in a paper read before the Michigan State Medical Society, Sept. 10, 1914.

A second case was reported by Robert Sattler to the American Ophthalmological Society in 1915.

The history of Lamb's case—the third instance—is as follows:

C. F., a young colored girl, was first seen on Nov. 16, 1916. She complained of pain and swelling in the left eye, accompanied by some discharge. The eye had been steadily growing worse since the beginning of the trouble. The day before the first examination she had a chill, followed by headache and a feeling of general malaise.

There was edema of the eyelids and a watery discharge. The conjunctiva of the lower lid was the site of six or seven small sharply defined deep ulcers, filled with yellow necrotic plugs. The conjunctiva of the upper lid was free from ulcers at this time. The preauricular gland on the left side was very much swollen and tender, the cervical glands were tender but not much enlarged. Questioning brought out the fact that two days before the onset of her trouble she had pre-

(2) [The adjectival portion of this term is sometimes incorrectly referred to as *tularense*, but, of course, *conjunctivitis* is a *feminine*, not a neuter, noun.—Ed.]

(3) Trans. Amer. Acad. Ophthal. and Oto-Laryngol., 1916.

pared some rabbits for the evening meal of the family where she was employed. A diagnosis of *conjunctivitis tularensis* (or squirrel plague conjunctivitis) was made. Dr. Wherry and the author's brother, Dr. Benjamin Lamb, studied the case bacteriologically and confirmed the diagnosis.

Guinea-pigs inoculated with secretion from the eye died on the fourth day, and from the numerous miliary abscesses in the spleen and liver, the *Bacillus tularensis* was isolated. Inoculations of guinea-pigs with blood from the patient were negative. Inoculation of ordinary culture media showed no growth. Dr. Benjamin Lamb was able, however, to grow the bacillus on egg yolk medium from inoculations made directly from the conjunctival ulcers. He also made an autogenous vaccine which was used therapeutically with most gratifying results.

On November 20, four days after the girl was first seen, and eight days after the onset, the disease had extended so that the discrete ulcers had fused into three or four large ones, and four small ulcers had appeared on the conjunctiva of the upper lid, two near the upper margin of the tarsus and two near the free border of the lid.

(See the colored illustration forming the frontispiece of this volume.)

The swelling of the lids had been reduced considerably by cold applications and flushing the conjunctival sac with boracic acid solution. The temperature of the patient was somewhat septic in type varying from 101 to 103 F., pulse 90 to 100. Her mental condition was drowsy and stupid. She complained of very little pain in the eye, but the glands of the neck were exquisitely tender.

On November 24, she received one-half minim of vaccine subcutaneously in the left arm. There was no systemic reaction, the highest temperature on the following day being 101, but at the site of the injection there appeared the next day several blebs surrounded by an indurated area, the size of a dollar. The following day the temperature rose to 102 F. The appearance of the eye was about the same.

On November 29, five days after the first injection

of vaccine, she received one minim in the right arm. There was a slight systemic reaction following this injection, the temperature going to 101 F., accompanied by headache, "stiff neck" and pain in the head and shoulder. The local reaction was much like that following the first injection.

The next day there was no rise of temperature and the appearance of the eye was much better. There was less secretion and the necrotic tissue had sloughed away from the ulcers, leaving clean-looking, bright red granular bases, rather deep but clean. The patient's mental condition was much better and she asked permission to be out of bed. Her temperature now remained normal until December 4, when she was given another minim of vaccine in the left arm. On December 5 her temperature rose to 102 F., pulse 120, with some headache and pain in the arm. On December 6, temperature and pulse were again normal. The swelling had nearly all disappeared from the lids, the small ulcers on the upper lid had become much smaller and the larger ones on the lower lid much shallower. The pre-auricular gland was still swollen and tender.

On December 10, the ulcers of the upper lid had disappeared and those on the lower lid had become much smaller. Recovery is now assured.

An Epidemic of Koch-Weeks Conjunctivitis. During an epidemic of conjunctivitis H. Noguchi and M. Cohen[4] examined seventeen cases in which there were epithelial cell inclusions at first, with subsequent Koch-Weeks infection; two cases of Koch-Weeks bacillus conjunctivitis, with subsequent appearance of inclusions; and six cases of epithelial cell inclusions alone. From these examinations the authors conclude that: (1) There are cases in which epithelial cell inclusions may alone be present in the conjunctival smears. In such cases no other pathogenic organisms, such as the Koch-Weeks bacillus or the pneumococcus, can be demonstrated in smears or cultures. (2) The conjunctiva can become simultaneously infected with the inclusion bodies and Koch-Weeks bacilli or other organisms. (3) In cases of acute or subacute conjunctival inflammations due to mixed infections the

(4) Archiv. Ophthal., March, 1916.

clinical features of each infection may be present. The course of the inflammation is, however, more prolonged. (4) Within recent years, the Koch-Weeks bacillus has only seldom been found in routine examinations. (5) The epidemic studied was of a severe type. (6) Clinically it is practically impossible to distinguish pneumococcal conjunctivitis from the Kock-Weeks conjunctivitis. Bacteriologic examination of smears and cultures is the only means by which the etiological diagnosis can be definitely established. (7) Conjunctivae of certain species of monkeys are susceptible to the von Prowazek inclusion bodies, but not to the hemoglobinophilic bacilli isolated from cases of epidemic conjunctivitis. (8) The injection of conjunctival scrapings containing the von Prowazek cell inclusions into the testicles of rabbits produces no cell inclusions in the latter, while the injection of a pure culture of the hemoglobinophilic bacilli causes an acute inflammation accompanied by numerous clumps of organisms, simulating the von Prowazek bodies at certain stages of their evolution. (9) There exists an apparent morphologic similarity between the degenerated forms of this variety of the hemoglobinophilic bacilli and the cell inclusions, both in cultures and in experimental orchitis in the rabbit. But, as a rule, the elementary bodies of the latter are much smaller and more sharply defined than the smallest granules of the former, while the initial bodies are bigger, more intensely stainable, and less definite in their contour than the hemoglobinophilic bacilli found in the infected conjunctivae.

Artefact Conjunctivitis. An aspect of military malingering is, with related subjects, discussed by Aubineau.[5] He reports that he examined many soldiers from the Moroccan division of the French army with the diagnosis "artificial conjunctivitis." Most of these men were suffering from ordinary acute, or subacute, bilateral conjunctivitis in eyes predisposed to the condition from old chronic conjunctivitis, or trachoma, and which yielded readily to treatment with sulphate of zinc, or silver salts, so that he has not been able to confirm the diagnosis. He considers that these attacks were the result of unintentional inoculation of the conjunctiva

(5) Ann. d'oculist., August, 1916.

with dirty fingers, or by the accidental introduction of dust into the conjunctival sac. He admits that this may have been done deliberately, but is of opinion that malingerers usually choose some painless method, which does not involve serious consequences, and that disappearance of the inflammation spontaneously, or under bandaging, is the rule. Although the introduction of dust into the conjunctiva, which has been the seat of old disease, may set up a true conjunctivitis, Aubineau considers that in the presence of an acute or subacute conjunctivitis without special features, nothing justifies an ophthalmologist in inferring retrospective etiological conditions as to its artificial or traumatic character. He regards unilaterality as suspicious, but not conclusive unless special objective signs are present, such as those associated with ipecacuanha conjunctivitis, *viz.:* absence of secretion, eczematous condition of the lid margins, lardaceous tint, and localization of the lesions in the lower palpebral conjunctiva. Finally, he records the case of a soldier sent to him as a malingerer with ipecacuanha conjunctivitis, who was in reality suffering from spring catarrh with conjunctival scarring and a fresh porcelain-looking opacity of the left cornea. The latter Aubineau attributed to injudicious treatment with nitrate of silver and yellow oxide of mercury simultaneously.

Conjunctivitis Petrificans. As the reviewer[6] of O. Valli's paper points out, this disease, sometimes called *calcification of the inflamed conjunctiva* is a rare condition and but little understood. Valli has recently described a case and has only been able to find thirteen other instances recorded. His own patient, a healthy soldier of 39, was struck by a branch in the left eye. This set up a mild and painless conjunctivitis, and the man was sent to hospital. He came under Valli's observation ten weeks after the receipt of the injury. On drawing down the patient's lower lid there was seen on the conjunctiva of its median third a small oval depression with sharply defined margins, like the depressed scar resulting from conjunctival cauterization. It measured 6 mm. in width and 5 mm. in height, and was covered with epithelium and richly supplied with blood-

(6) Brit. Med. Jour., Dec. 23, 1916.

vessels; its floor displayed numerous white specks, scattered or grouped together. In the region of transition the conjunctiva exhibited an irregularly oval elevation, whitish in color, 5 mm. in length, and situated in the conjunctival tissue; vessels of various calibers arrived at its periphery and disappeared into it, a few passing over its surface. Touched with a probe this nodule seemed hard and solid; near by were four small whitish specks, slightly elevated above the surface and covered with epithelium. The upper lid was less injected than the lower, but showed whitish specks and a depressed area similar to but smaller than that described above. The bulbar conjunctiva was moderately injected, and displayed a number of small and slightly elevated spots of a milky-white color; a larger one, the size of the head of a small pin, was placed 3 mm. to the right of the limbus a little above the median horizontal line. The cornea, iris, fundus, and visual power of the affected eye were all normal. The patient gave negative Wassermann and von Pirquet reactions, and his blood count was normal. He remained ten weeks under observation; during this period many of the whitish conjunctival spots were absorbed spontaneously, while other new ones made their appearance in the conjunctiva of both the lids and eyeball. The man left the hospital with the condition of his left eye much improved. Bacterial cultures of the conjunctival secretion showed the presence of a few staphylococci and xerosis bacilli, or else gave negative results. One of the conjunctival nodules was excised and portions of it were implanted in the anterior chamber and also under the bulbar conjunctiva of a rabbit; both fragments remained inert and gave rise to no inflammatory process. Valli made elaborate histologic and histo-chemical examinations to discover the structure and nature of the nodules he excised from the patient's conjunctiva. Stained sections of these tissues showed that they were covered by unaltered conjunctival epithelium, and consisted of collagenous fibrous tissue infiltrated here and there with lymphocytes, plasma cells, or small groups of eosinophile corpuscles; the white flecks consisted of deposits of calcium carbonate and phosphate in fibrous tissue that had undergone hyaline degenera-

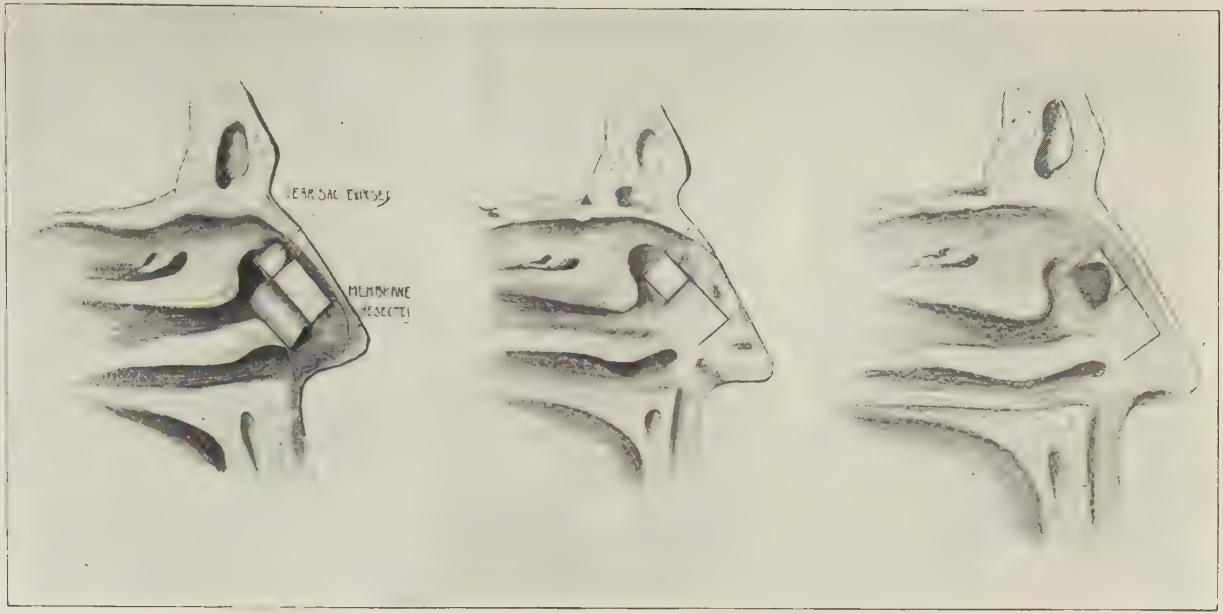
tion. The neighboring hyaline tissue also contained minute calcareous granules in its interstitial spaces, and hypertrophied connective tissue cells enclosing calcified particles, in the vicinity of the areas of extensive calcification; this, Valli says, is usual in the calcification of tissues that are not necrotic. The vessels in the calcareous patches were surrounded by rings of hyaline tissue. The hyaline tissue stained by Mann's method showed basophilia; no evidence of fatty or lardaceous degeneration could be found.

Valli concludes that the slight inflammatory infiltration shown by the nodules was in part a legacy of the original trauma, in part a reaction to the process of calcification. He doubts whether the commonplace injury originally sustained by his patient can be held to account for the occurrence of so rare a form of conjunctivitis. In none of the other thirteen cases he has found in the literature was a simple trauma mentioned as the cause. In several, however, there was a suspicion that the petrifying conjunctivitis was factitious, provoked and maintained by the patient (generally a young woman or boy); yet in no case has one of these patients been detected in the act of cultivating or tampering with the lesion. Valli exonerates his own patient from any such suspicion. Beyond suggesting that the process may sometimes have been initiated by the accidental or intentional introduction of lime salts into the eye he leaves the pathogenesis of petrifying conjunctivitis unexplained.

DISEASES OF THE LACHRYMAL APPARATUS.

New Method of Treatment of Suppuration of the Tear-Sac. The procedure described by K. Schuster[7] is that of Peters, which consists in slitting the lower canaliculus and cutting the strictures by constant turning of the blunt-pointed knife, introduced into the naso-lachrymal canal. It effected a cure in 77 per cent. of cases. The failures were perhaps due to affections of the accessory cavities of the nose which,

(7) Klin. Monatsbl. f. Augenheilk., Vol. 55, p. 596, 1916.



The intranasal tear-sac operation.—Mithoefer (see page 53).

according to the investigations of Rhese and Brunslow, were found by examination with Roentgen rays in about 37 per cent. of uncomplicated suppurations of the lachrymal sac. If this should prove true, one has in future to give preference to the intranasal treatment of the sinuses before resorting to extirpation of the lachrymal sac.

Lead Styles in Treatment of Obstructions of the Nasal Duct. H. Moulton[8] uses the electrician's fuse wire instead of lead. The canaliculus must be slit and the lachrymal duct well dilated before the style is introduced. Care must be taken to look for the lachrymal probe under the inferior turbinated body to see that it is actually in the nose. The style must not be too short, because if it is it may drop down and its bent end be in the lachrymal sac from which position its extraction is difficult and painful. If too long it does not ride well. It should be tried in position several times until its length is just short of resting on the floor of the nose. The upper end is bent at right angles to form a lip which has just a little downward bend and rests in the slit canaliculus. The bend of this lip will have to meet the requirements of each case and upon its resting in the canaliculus and not outside of it depends the comfort of the patient. Generally speaking, the patient should wear the style for a year or more and come for monthly readjustment and cleansing of the style.

A New Method of Extirpation of the Lachrymal Sac Without Resultant Scar. According to J. A. Kearney,[1] no visible facial scar may be assured the patient who submits to the operation for the removal of the lachrymal sac by way of the slit canaliculi.

Most ophthalmic operators have experienced great difficulty in obtaining the patient's consent when a suggestion to remove the sac through a facial incision with a certain scar remaining of uncertain dimensions, but little or no objection is offered to the operation promising as good result without a scar. Espec-

(8) Ann. Ophthal., January, 1916.
(1) Med. Record, Aug. 19, 1916.

ially is this the case with women. When there has existed for a time an annoying chronic dacryocystitis of either the catarrhal type, with regurgitation of mucoid secretion into the conjunctival cul-de-sac, or the recurrent phlegmonous type, the extirpation of the lachrymal sac becomes imperative, and the patient is confronted with the choice of operation.

It is possible to do this operation with a local anesthetic injected into the skin about the sac, but it is much more satisfactory to administer complete anesthesia, preferably ether.

The conjunctival cul-de-sac is flushed with a saturated boric acid solution after the contents of the lachrymal sac are milked into it. Bowman's Number 1 probe is passed through each canaliculus as far as the bony wall; this dilatation allows the engagement of the tip of a Weber's knife, which is passed down the upper canaliculus, making the usual Bowman slit, then down the lower one in the same way. There usually remains a bridge of tissue between the distal ends of the incisions. This is severed with a curved bistoury. The anterior lachrymal crest is then located and the internal canthal ligament is divided at its insertion here.

The diseased sac and the surrounding granulomatous tissue and the bone beneath, when found carious, are then broken up by the appropriate curettes and scraped out through the original incision. The walls of the canaliculi are scraped also. The cavity is then cleansed with a swab saturated in bichloride of mercury solution (1 to 500). A thick pad of cotton wrung out of saturated boric acid solution is placed over the operated area and a head bandage is applied firmly over it so as to produce pressure sufficient to keep the walls opposed and prevent swelling.

The after-treatment consists of cleansing of the conjunctival cul-de-sac and the renewal of the bandage daily for three or four days.

The advantages of this operation are: (1) There is no scar remaining on the face; (2) there is less difficulty in obtaining consent to operate when no facial scar is assured; (3) there is much less hemorrhage during the

operation; (4) there is no possible return of the condition, because the mucous lining is ablated from the puncta to the upper portion of the nasal duct.

The Intranasal Tear-Sac Operation. William Mithoefer[2] gives a clear exposition of the improved West operation whose virtues he extols. He claims that ophthalmologists generally see few lasting results from probing the nasolachrymal duct. With an improvement in technique West now claims 90 per cent. of cures.

Excision of the sac externally is not always satisfactory; occasionally the tear gland has, in addition, to be removed.

The intranasal removal of the tear sac is indicated after conservative external methods have failed, together with a careful intranasal examination to eliminate the possibility of ethmoid disease as a causal factor.

In examining the nose one may see a protuberance on the outer nasal wall, which corresponds to the position of the lachrymal sac, in front of the anterior end of the middle turbinal. In operating intranasally on the lachrymal sac this is an important landmark and West chooses to call it the *torsus lachrymalis*. Any abnormality, *e. g.*, deflected septum, prominent pyriform process, etc., must be operated on first, to insure a good exposure of the lachrymal sac.

Technique of Operation: "The first incision is made from behind forward above the protuberance corresponding to the tear sac, the second in the same direction below this protuberance. The knife used for these incisions must be long and slender. Vertical incisions joining the ends of the first and second incisions are now made anteriorly and posteriorly." The mucous membrane is then submucously resected. Occasionally in a very narrow nose this flap has to be extended downward to give sufficient exposition (Plate IV). The bone is removed with a chisel until the sac is exposed. Pressure is then made over the sac externally, which can be then seen bulging through the field. The sac wall is then removed and the success of the operation depends upon whether or not enough of this wall is removed. If it

(2) Ohio State Med. Jour., September, 1916.

was necessary to extend the flap to give sufficient exposition gentle packing is used to hold it in position.

Granulations are kept in abeyance by use of silver nitrate.

DISEASES OF THE CORNEA AND SCLERA.

Superficial Linear Keratitis. Holmes Spicer and A. Greeves[3] describe this condition in a case in which there were superficial ridges of epithelium raised above the level of the cornea, mostly running in vertical lines, grey and tapering, and having along their course a bulging node-like appearance. They had tapering ends and did not extend quite to the limbus. They not uncommonly showed punctate staining, but there was no iritis. The tension of the eyeball was nearly always minus, and during such times the vision was definitely impaired, though it recovered when the normal tension was re-established. It differed from dendritic ulcer (which it appeared to simulate), especially in the reduced tension. No measures which they employed prevented recurrences.

Pasteurization of Corneal Ulcers. A. E. Prince[1] warmly recommends this method which he applies by means of a pasteurizer, an instrument in the shape of an elongated egg mounted on a handle (Fig. 13).

The end of the instrument is held in the flame of the gas or the alcohol lamp until it is red-hot; the lids are separated by the first and second fingers, and the patient directed to look so as to bring the cocainized (by one drop of a 4 per cent. solution) ulcer into the middle of the palpebral aperture (Fig. 14). The heated ball is held about three-sixteenths of an inch from the ulcer until it cools. The amount of heat can be appreciated by the fingers of the operator, and the ball may be made to approach the cornea as the heat diminishes. To acquire familiarity with the amount of heat which actually reaches the cornea, it is well to approximate the heated end to the bulb of an ordinary thermometer. The temperature should not register more than 150 F.

(3) Lancet, Feb. 12, 1916.
(1) Ophthal. Record, April, 1916.

The results are better than those following the application of the cautery because no additional tissue is destroyed. It is also found that the resulting scar is less opaque. Pus in the anterior chamber is usually absorbed without perforation, or the necessity of performing paracentesis. The cornea at the margin of the ulcer remains clear, and does not show the usual tendency to become hazy from the extension of the pathogenic microbes between the layers of the cornea and along the lacunar circulation.

Neuropathic Rosacea Keratitis. Under this caption F. H. Verhoeff[2] refers chiefly to *peripheral corneal lesions accompanying herpes facialis*, and which are neuropathic in origin. They are located about 1.5 mm. from the limbus and the author believes that they occur at the terminations of the conjunctival nerves in the cornea, and that they are manifestations of the general tendency of herpetic lesions to occur at the periphery of the area of nerve distribution. The author has shown that, histologically, the lesions of superficial punctate keratitis consist of localized infiltrates of necrotic pus-cells situated immediately beneath Bowman's membrane. His method of treatment is to do a partial peritomy, thus preventing abnormal impulses from reaching that portion of the cornea. Healing promptly occurred in fifteen consecutive patients operated on. In twelve of the cases, the corneal lesions failed to stain with fluorescin at the end of forty-eight hours and in the remaining cases they could be stained slightly for a day or two longer.

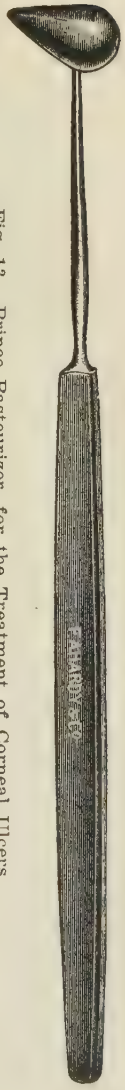


Fig. 13. Prince Pasteurizer, for the Treatment of Corneal Ulcers.

(2) Archiv. Ophthal., March, 1916.

Fig. 14. Prince's Pasteurizer. Showing application (page 54).

Fibroma of the Cornea. The etiology of this rather rare neoplastic growth is generally dismissed in ophthalmic literature, according to W. E. Schenck,[3] "as the result of some ulceration of the cornea."

In the writer's case there was a pterygium as its base; it is possible that some irritation or ulceration of the pterygium at its site permitted the fibroma to occur and thus prevented the extension of the pterygium across the pupillary area with hopeless destruction of the function of the affected eye. The growth was the size of a large split pea and prevented the patient closing his eyelids because of the pain due to this act. It was located midway between the limbus and pupil of the right eye, and the pterygium extended from the outer canthus upon the cornea with the fibroma in its apex (Fig. 15).

(3) Lancet-Clinic, Sept. 23, 1916.

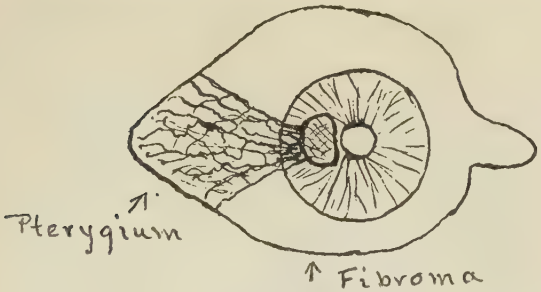


Fig. 15. Fibroma of the Cornea.

Gumma of the Sclera. This syphilitic neoplasm is so rare that only about thirty cases have been reported, and they occurred from ten months to eight years after the chancre. E. M. Blake and J. E. Lane[4] (who describe a case) point out that the structure of the sclera probably explains the infrequence of the development of gummas in it. The dense fibrous tissue and the few elastic fibers of which it is composed form a strong, hard and inelastic tissue, which is not a favorable ground for the development of the rounded, limited, elevated growth, hard at first and tending to soften and break down in the center, which is typical of the gumma.

Deep scleritis frequently shows some nodules which are too small and too irregular to be classed as gummas. These nodules are very often multiple, and the two eyes are frequently affected at the same time. This condition is usually refractory to treatment and is frequently complicated by opacities in the cornea, iris and vitreous, and by other secondary changes in the other coats of the eye. Fuchs states that recurrent scleritis does not ordinarily have a syphilitic origin, but that isolated nodules are sometimes found in the sclera as a result of syphilis. It is very likely that these nodules in rare cases develop into gummas.

Dermoid of the Corneo-Scleral Margin. Adolph Pfingst[5] describes one of these benign, teratoid tumors at the sclerocorneal junction in a young woman, aged 24,

(4) Jour. Amer. Med. Ass'n., Dec. 30, 1916.
(5) Southern Med. Jour., July, 1916.

in good health. She had a birth-mark on the left eye. The growth which was noticed soon after her birth had grown somewhat in breadth and height, and recently had developed hairs on the surface. It had never caused trouble in the way of pain and never caused the eye to become inflamed. At the outer margin of the cornea of the left eye, low down, there is an irregular hemispherical prominence of firm consistency about 3/16 of an inch in diameter. It is pink or faintly yellowish-pink and resembles a half pearl. It springs from the conjunctiva and slightly overrides the cornea.

Dermoids nearly always ocur singly, but cases are on record in which the two eyes had symmetrically located growths, and also where two growths sprung from the same eye, one from the outer, the other from the inner corneal margin. Although usually flat, they sometimes have a conical shape, and exceptionally have been found pedunculated. Treacher Collins states that they are nearly always oval, their long diameter corresponding with the palpebral fissure.

They usually increase slightly in size with the general growth of the body and remain stationary after the eye has attained its full growth. In rare cases they have been known to proliferate over a large portion of the cornea.

Those that increase in size do so on acount of the development of adipose tissue, when they are spoken of as lipodermoids. Their usual size is 2/8 to 3/8 of an inch in diameter and 1/8 inch in height.

Dermoid tumors of the corneoscleral margin have also been observed in lower animals, notably sheep and cattle. Their presence on the eye usually causes no symptoms unless they are very large. The hairs on the surface, which usually make their appearance about puberty, may set up conjunctival inflammation, and it is about this time that these patients most frequently consult the surgeon. These growths should be removed if for no other reason than to gain a cosmetic effect. They should be removed early, after the child has passed the first year. The danger of recurrence is slight if excision has been complete.

DISEASES OF THE UVEAL TRACT.

Etiology of Iritis. The paper of Brown and Irons[6] is on 100 cases of iritis (forty-seven private and fifty-three clinical), and the authors undertook their researches primarily to determine the causes of so-called "rheumatic" iritis; in the absence of any clear distinguishing features of this form, apart from etiology, they have included all cases of non-traumatic iritis, and, after as complete an examination of each case as possible, they have grouped them in accordance with the causes discovered in each. Their report does not pretend to give a complete list of all the causes of iritis, but it forms a record of what infections they found, and of the evidence for and against the etiologic relation of each to the iritis in the cases under observation.

Each case of iritis was examined most carefully to detect the presence of syphilis, tuberculosis, gonorrheal infection, and infections of teeth, tonsils, sinuses, prostate, pelvis, or other structures which might give rise to lesions in the eyes or joints. Laboratory examinations included ninety-eight Wassermann tests controlled by two laboratories, the complement-fixation tests for gonorrheal infection, radiographs of teeth, sinuses, and lungs, and cultures of pus from tonsils, sinuses, prostate and other infected tissues. Tuberculin tests, using 1, 3, 5, 10 mgm., were made in suitable cases. After the data arrived at had been recorded, suitable measures were taken to remove all sources of infection, where this was possible, and from the course the attack of iritis took after these procedures, they obtained valuable evidence confirmatory of the etiologic diagnosis.

In a surprisingly large number of cases they found evidence of an association of two or more infections; *i. e.*, infections of teeth, tonsils or sinuses were frequently found with syphilis or gonorrheal infection. By carefully weighing all the evidence they were able to determine, in most cases, which infection was responsible for the ocular disease; but the available evidence was not

(6) Trans. Am. Oph. Soc., Vol. XIV, 1916; abstracted in Ophthal. Review, October-December, 1916, by R. R. James.

in every case sufficient, and they have placed such cases in a "combined" group.

It is impossible to do better than transcribe their table, which shows clearly the number of times each infection was found in direct etiologic relation with the iritis; and the coincident injections found: it is as follows:—

	Alone.	With other infections.	Total.
Syphilis	10	13	23
Gonococcal	7	2	9
Tubercle	8	..	8
Dental	7	11	18
Tonsil	7	9	16
Sinuses	1	2	3
Gen.-urin. (non-ven.)	3	..	3
Other infections	2	..	2
Combined	..	..	17
			99

COINCIDENT INFECTIONS.

	Syph.	Gon.	Tub.	Dental.	Tonsil.	Sinus.	Genito-urinary.
	..	8	5	5	1	1	..
	..	..	..	1	1	..	..
	..	..	..	..	..	..	..
	2	2	2	..	7	1	..
	1	3	2	7	..	..	..
	..	..	..	1	1	..	..
	..	..	..	..	..	..	..
	..	..	..	1	..	..	..
Combined	.. 8	9	7	8	13	5	1

Each of these headings is discussed in detail; it is not necessary to epitomize their remarks on each, but it is worth while to notice in their dental group that they do not include peridental infections, such as pyorrhea, as possible causes, unless they were closed processes, *i. e.*, apical abscesses.

Diabetes was found in three cases, but in each instance other infections were also present.

The "combined" group was largely composed of dispensary patients. In twelve of these seventeen cases recovery followed the removal of infectious processes. In two cases satisfactory results were not obtained despite months of treatment; secondary glaucoma was present in each. In two cases the authors were unable com-

pletely to eradicate the infections, and one of these patients is slowly improving under tuberculin.

The authors conclude that "from the clinical study, and from our experiments thus far, it would appear that not one but several factors are concerned in the production of iritis, among which may be noted the presence of a focus of infection in which bacteria may live and multiply, partially protected from the resisting forces of the host; the periodic entrance into the blood-stream of these organisms and their lodgement in the eye, either by reason of their great number, as in sepsis, or by fortuitous embolism; changes in the eye itself, either in vascular anastomoses or in susceptibility of the ocular tissues, owing to previous injury; and, finally, changes in the organism itself, whereby it may become better able for a time to maintain itself in the tissues of the eye. Such adaptations on the part of the organism do not necessarily imply any demonstrable change in its morphology or cultural reactions."

Pigmented Nevus of the Chorioid. An example of this very rare neoplasm is reported by A. Magitot.[7] The article is also extensively reviewed by W. C. Souter.[8]

A man of 40 was admitted to the Lariboisière in 1911 for a tumor of the ethmoidal sinus, and Magitot, examining the eyes, found a moderate exophthalmos of the left eye, with difficulty chiefly in adduction, fundus normal except for slight fulness of the veins. In the course of the operation it became necessary, quite unexpectedly, to remove the eyeball.

During the section of the eye, Magitot noticed a pigmented bulging of the chorioid. It was about 1.5 mm. long in the axis of the membranes, and 0.5 mm. thick, lying almost equidistant between equator and papilla. With the usual stains the sections showed the tumor to be extremely pigmented, obscuring all details, disposed longitudinally and ending insensibly without sharp transition in the surrounding chorioidal zones, extending outward to the sclera and invading suprachorioidea and forward to the chorio-capillaries but not beyond it, leaving the retinal pigment epithelium layer absolutely nor-

(7) Ann. d'Oculistique, March 1916.
(8) Ophthal. Review, December, 1916.

mal; retina pushed forwards somewhat by the tumor but not detached; tumor was traversed by chorioidal arteries and veins, but there was no increase in the number or caliber of these vessels, unless possibly the caliber was a little diminished; the retinal layers were all quite healthy. After depigmentation further detail was obtained so that the properly so-called neoplastic tissue was seen to consist of voluminous cells with two aspects, one set of cells polygonal, epithelioid, compressed against each other, size at times 30-35μ, nuclei oval, choked with chromatin, situated almost at the center of the protoplasmic body, nucleus single, double or triple; the other cells were fusiform, with plenty of protoplasm and elongated nucleus, suggesting connective-tissue type. Cells of both kinds had protoplasm packed full of pigment granules while the fusiform variety were specially disposed opposite the vessels of the tumor, which possessed their normal endothelial lining. In fact the wall of the chorioidal arteries was devoid of muscular and elastic tissue and consisted of the endothelium sheathed by these elongated cells. These fusiform cells abutted on the chorio-capillaris, which acted as the limitans interna of the tumor, but did not penetrate it anywhere. The fusiform cells were disposed peripherally and the epithelioid polygonal ones centrally; all appeared to be adult cells; there was no sign of malignity, on the outer aspect sclera was free, of normal thickness, and not invaded by tumor cells.

Magitot lays stress on the fact that all the cells were pigmented, that all stages of transition from the polygonal to the fusiform cells could be found, that these were disposed about the vessels, that the retinal epithelium layer was quite intact, to argue that the tumor chromatophores had a mesodermic and an ectodermic origin, and not merely an ectodermal, while in support of this he cites the embryologic findings that the anterior part of the uveal pigment has an ectodermal origin, starting about the fourth month while the posterior part has a mesodermal, starting not far from the optic nerve towards the end of the fourth month of fœtal life. The pigment deposit for the retinal epithelium, however, appears very early, towards the end of the first month.

A noteworthy feature is the association in this case with an epithelioma of the ethmoidal sinus, in agreement with one of Wolfrum's chorioidal nevus cases in which the eyeball was removed for an epithelial tumor of the orbit.

Sarcoma of the Chorioid. B. Castresana[9] has encountered sarcomas of the chorioid in the proportion of five or six to each 10,000 patients with eye affections—about the usual average of frequency. He emphasizes the extreme importance of an early diagnosis, and discusses the first signs of the affection as he studied them in three recent cases. One patient is the chief of a bacteriologic service, aged 59. About a year ago he noticed a blurring in the outline of microscopic specimens, with dark specks, but vision for ordinary objects was normal. After about six weeks there came a dark spot in the upper segment of the microscopic field. Soon this dark spot became manifest in ordinary vision, and it gradually encroached more and more on the visual field. The diagnosis of circumscribed hemorrhage or tumor in the chorioid was confirmed by a bulging into the vitreous. There never had been pain at any time, although the intra-ocular pressure was slightly above normal. Nothing abnormal elsewhere was found as the eyeball was enucleated, the melanosarcoma being restricted to the chorioid. In the second case, a man of 30, about a month and a half after a piece of dirt had been flung into one eye, found that vision in this eye became imperfect, the upper and outer part of the field being shut off. A large tumor was found in the chorioid, hard and nonmovable, and slight pain was experienced as the tumor was pressed. In both these cases vision previously had been normal, but the third patient, a man of 60, for ten years had been wearing glasses to correct hypermetropic astigmatism. Four months after a blow on one eye, an oval spot interfered with vision in that eye and objects also appeared distorted, with luminous sensations. In all these cases the eye appeared normal until examined with the ophthalmoscope.

(9) Siglo Medico, Oct. 21, 1916; abstracted in Jour. Amer. Med. Ass'n., Dec. 2, 1916.

THE CRYSTALLINE LENS.

Cataract.*

A New Mode of Extracting the Lens in Its Capsule. Commenting on the *intra-capsular extraction* of cataract Ernest Maddox[1] directs our attention to the fact that so long ago as 1888 Mr. Higgins, of Guy's Hospital, contributed a paper to the *Lancet* on the removal of the lens in its capsule by means of an ordinary *straight* Taylor's vectis, through a *downward* incision of the cornea.

It was one of the brave attempts at the ideal after which so many have striven, but since (to quote his honest words) "in five out of six cases vitreous was lost," the method fell into disuse. Now, however, that Col. Henry Smith's admirable contributions have given a fresh stimulus to the radical extraction of the lens, it is natural to cast about for the best means of dealing with cases which are not suitable for his method. Many patients are too young for his method, others too old, or at least with lenses too hard and large for the size of the cornea, or with eyes too myopic or prominent to be quite pleasant for the Jullunder operation. As one more addition to the valuable alternatives suggested by others the writer has tried to contrive a lens loop whose use shall be compatible with an *upward* incision of the cornea, and at the same time, be capable of very delicate manipulation. At first he merely bent a Taylor's vectis to a right angle with its stem, as shown in the upper illustration in Figure 16 (A), and swathed his handle with thick rubber tubing to allow smooth rotation about its own longitudinal axis and to afford that sure and delicate grip which is peculiar to rubber. This improvised instrument answered well, and he extracted several lenses in their capsules with it, all of which resulted well, though two were slow in healing owing to the large corneal incision. However, in later cases Maddox found that the loop is compatible with a Desmarres' bridge,

*An article on "Traumatic Cataract in War" will be found under the heading of "Military Surgery of the Eye," on page 154, this volume.

(1) Ophthal. Record, July, 1916.

and the avoidance of an infracorneal incision in this way greatly favors rapid healing. The chief object of a loop set at right angles to its stem (instead of straight on its end, as in all previous lens loops figured), is to avert the necessity of making the patient look strongly downward for its insertion, since to do so, as Col. Smith has shown, favors escape of vitreous when there remains nothing to restrain it but the hyaloid. The shape of the best loop is shown in Figure 16 (B). The handle is of aluminum, preferably covered with rubber. The length of the loop is greater than that of the vectis, and the shape somewhat obovate, but with a slightly pointed end to break through the suspensory ligament above. Its greatest breadth should be one-third of its length from the point. The wire is smoothly rounded everywhere except that it retains a squared edge for two or three millimeters at the posterior margin of the surface which touches the crystalline at the extremity of the loop. This edge, which does not come into contact with the hyaloid, engages with the capsule of the lens as soon as the loop begins to be withdrawn, and should be smooth enough not to scratch the capsule, though gaining a good grip of it.

The instrument has to be supplied in pairs, one for the right and one for the left eye. To get over the top

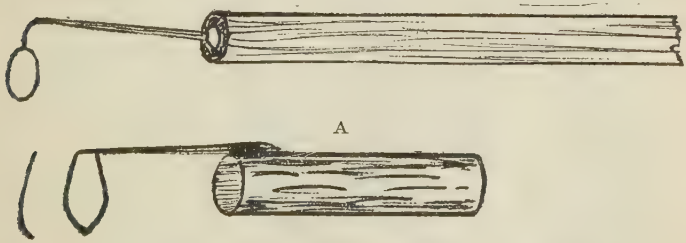


Fig. 16. The Maddox Vectis for the Extraction of Cataract in Its Unruptured Capsule.

of the lens by perforating the suspensory ligament above is the most difficult part of the manipulation, and in some cases the writer perforated the ligament in this situation first with a zonulatome. A skilled assistant is highly desirable, furnished with a Fisher's hook or a

strabismus hook, the end of which is prolonged a few millimeters temporalwards at right angles to its shank.

In the absence of an assistant, Maddox uses the "Featherweight" *aluminium* speculum, as in Figure

Fig. 17. Specula for Extraction of Cataract in Its Capsule.

17 (3), made at his suggestion by Messrs. Weiss & Son about two years ago, and with which many have expressed satisfaction for ordinary extraction since. It should be provided with a spring strong enough to overcome the contraction of the orbicularis, and with two nuts on the threaded crossbar, one of which (a) is adjustable to prevent painful stretching of the lids, while for ordinary use the other one (b) is thrown out of the field of action by being run up to near the pivot of the crossbar, to allow the speculum to be instantaneously closed by the operator. Should it be desirable, on the other hand, entirely to immobilize the speculum, this nut (b) can be run up to the other end of the crossbar. With an unusually strong orbicularis it may be desirable to do this for the corneal incision.

When a trained and sufficiently skilled assistant is available, a lid hook or elevator is superior to any form of speculum, but with indifferent assistance either a Summer's speculum can be used, or else a speculum fitted with a large grip handle, such as shown by the writer at the meeting of the British Medical Association in July, 1914, and which is depicted in Figure 17 (4), though with undue massiveness. A similar instrument has also since been devised by the Drs. Green of San Francisco. That bar of the grip speculum which controls the lower lid, rotates freely on the cylindrical and smoothly rounded stem, and is not touched by the assistant after its insertion till the time comes for its withdrawal. This leaves the grip handle in rigid continuity with the upper lid-loop only, so that the upper lid can be drawn forward when desired, without thinking of the lower lid, which the lower bar clings to automatically by reason of its anteroposterior freedom, though the spring presses it downwards all the time.

A more varied experience will no doubt enable the shape of the upper lid wire to be improved upon, or a T-piece, suggested by Derrick Vail's lid hook, may be employed, as also shown in Figure 17 (4a). This should be bendable to any desired shape. The best speculum, however, is not equal to a hook.

Another expedient of distinct advantage in loop extraction is the "superior rectus thread." In drawing

out the whole lens by a lens loop it is important to have some control of the eye to keep the cornea from being drawn upwards by the loop. Yet countertraction by fixation forceps below the cornea favors vitreous escape, and Angelucci's fixation does not sufficiently relieve the globe from the pressure of the upper lid to be recommended for intracapsular extraction. The traction thread of Maddox does not interfere with the use of any appliance for raising the upper lid from the globe, whether speculum or hook, and allows the globe to be drawn partly down at the critical moment, simply by antagonizing the superior rectus and thus relieving the eyeball from muscular pressure. It is passed through the episcleral tissue over the insertion of the superior rectus, as the first step of the operation, and is then so laid over the temple as to remain undisturbed if the speculum is whipped out. Quite a fine, black (aseptic) thread suffices. When taking the lens loop in the right hand, the black thread should be taken in the left, ready to steady the eye if necessary during withdrawal of the lens, against the inevitable resistance which the suspensory ligament offers to the force which ruptures it. The direction of traction should correspond pretty closely with the line of the superior rectus tendon. After the escape of the lens the thread again comes into use for the reposition of the iris, taking care to use it gently, so as to draw the eyeball downwards no more than is just needed. The eyelids are now closed in the usual way, and one part of the thread divided with scissors close to the lid margins, so that by traction on the other part it comes away quite easily with the eye still closed.

The string is not necessary, however, if a Desmarres' bridge is employed, since the latter can be drawn upon by smooth forceps so as to act in the same way. A modified Desmarres' bridge is his favorite practice, since it ensures such rapid healing. It is cut so as to spring, not from the center of the corneal flap, but a little to one, preferably the nasal, side.

When a "bridge" is impracticable, what might be called a "whisker incision" is next best. In this, both the puncture and counter-puncture are made through a little conjunctiva on each side of the cornea, though the

knife is made to emerge through the limbus at the apex perpendicularly to the surface of the cornea. This allows a thread loop to be inserted easily, though the extremities of the incision are covered with conjunctiva of so short a breadth as rarely to infold.

A New Method of Removing Zonular Cataract. This procedure is thus described by E. Krückmann:[2] A discission knife pierces the temporal portion of the conjunctiva in the horizontal meridian, 3 mm. from the limbus, and then the corneal margin to the center of the enlarged pupil, followed by a vertical incision of the anterior capsule from the upper pupillary margin, and by a horizontal incision from the nasal pupillary margin. Then the cortical matter is incised horizontally. From the temporal end of the incision the knife is introduced behind the cataract to dislocate it into the anterior chamber, where it can easily be cut into pieces from behind. After a few days a lance-shaped knife is inserted 3 mm. from the limbus subconjunctivally and at the corneal margin introduced into the anterior chamber and into the cataractous masses, which by gentle lateral movements are cut and then carefully removed. This method gives excellent results, so that glasses can be ordered after two or three weeks.

Discission Operation for Cataract. A practical paper (that should be read in the original) on this important subject, is that by Edward Jackson,[3] who advises for the first entering of the lens a rather broad needle, as the Bowman stop-needle, or the medium size of Knapp's knife-needles, which will make a sufficient cut in the capsule by the mere forward thrust. When, however, it is desired to divide the nucleus, he prefers, as for dividing the capsular membrane, the narrow knife-needle of the Hays-Ziegler type. In all cases the eye is placed and kept fully under the influence of atropine, at the time of operation and so long as there is any noticeable reaction. In some cases ethyl-morphine hydrochloride (dionin) is preferred to hasten the process of absorption, after reaction from the needling has subsided. No very marked benefit could be traced to the latter. Some-

(2) Graefe's Archiv f. Ophthal., p. 322, 1916.
(3) Jour. Amer. Med. Ass'n., July 29, 1916.

times when the eye has become entirely quiet after needling, the absorption of the lens becomes rather sluggish. He then omits atropine, hoping that the action of the ciliary muscle will rather hasten the process of absorption.

Jackson concludes that for monolateral cataract up to middle life, discission is to be considered as a proper procedure; and in many cases the patient will prefer it to extraction. The first discission should make only a short opening in the capsule; but may well penetrate to the center of the nucleus, so that disintegration of the nucleus may begin as soon as possible. The amount of swelling from a given interference will be proportioned to the size of the opening in the capsule, and the absence of previous change in the lens substance. Severe reactions and surgical shock are provoked by the presence of large masses of lens substance in the anterior chamber. Possible hemorrhage, from making the puncture through the vascular limbus, causes no danger to offset the greater safety from infection secured by this point of entrance.

Dressing After Cataract Operations. To produce even pressure over the front of the eyeball after cataract extraction, Maynard[4] uses swabs of wet, sterilized wool. The wool should be pulled, not cut, into pads, about an inch thick and 3 inches in diameter. They are then sterilized by boiling in 1 in 5,000 biniodide solution. After the completion of the operation two of these, sopping wet, not squeezed out, are laid on the two eyes. With the straightened fingers they are gently pressed down over the eyes, so that the swab becomes molded to the eye and fills in the hollows round it. Over this swab is placed a wet pad consisting of lint or six layers of gauze and then a figure of eight bandage is applied fairly firmly. On opening the dressing next day the wool gauze will be found dry and forming a complete mold of the eyeball and orbital opening. This wet molding method is very comfortable and produces no feeling of uneven pressure while it allows the eye to move easily. It is almost impossible to open the eyelids.

(4) Indian Med. Gaz., April, 1916.

THE RETINA AND OPTIC NERVE.

Types of Hemiopia. No less than *seventeen forms of the visual field that may arise from lesions of the chiasm or its immediate vicinity,* have been noted by G. F. Suker.[5] These are as follows:

1. Bilateral nasal hemianopsia. 2. Temporal hemianopsia with upper outer temporal hemianopsia in the other eye of the quadrant type. 3. Bitemporal quadrant hemianopsia. 4. Blindness in one eye with upper temporal quadrant hemianopsia in the other. 5. Central scotoma—unilateral or bilateral. 6. Right and left hemianopsia superior and inferior. 7. Unilateral temporal quadrant hemianopsia, right and left. 8. Unilateral nasal quadrant hemianopsia, right and left. 9. Complete bitemporal hemianopsia. 10. Bitemporal quadrant hemianopsia superior and inferior. 11. Central scotoma, accompanied by a homonymous hemianopic blind area on the temporal side of other eye. 12. Complete amaurosis in one eye with temporal hemianopsia in the other. 13. Central bitemporal hemianopsic scotomata. 14. Peripheral bitemporal hemianopsia with central temporal hemianopic scotoma. 15. Unilateral central temporal hemianopic scotoma. 16. Bitemporal color hemianopsia. 17. Bitemporal hemianopsia with central scotomata.

Congenital Word and Letter Blindness. About sixty-four cases of this disease have been reported, yet T. R. Whipham[6] considers that *alexia congenita* is more common than is usually supposed. It is more prevalent in boys than in girls, the ratio being forty-seven to seventeen. More than one member of a family may be affected. The writer records the history of one case in a healthy girl of 8, whose intelligence was moderately good, although perhaps a little below the normal standard. Her chief difficulty was with letters, both in reading and spelling. She had difficulty with words even of two letters. "At" would at times be written "ta," and "dog" "gdo." She could write her christian and surname together, but not separately. Writing from

(5) Illinois Med. Jour., December, 1916.
(6) Ophthalmoscope, January, 1916.

transcription, she made curious mistakes, *e. g.*, "transcriptino," "copy writino." She had no word-deafness. Her sight was good, and there was no hemianopsia or nystagmus. The Wassermann reaction was positive. The author expresses the opinion that the lesion may have been syphilitic, and situated around the posterior extremity of the fissure of Sylvius. The visual word and letter center is in the left supramarginal and angular convolutions. It is difficult to explain why the right side does not take on the functions. The outlook is not quite hopeless; improvement may be expected with systematic and sympathetic training.

Unilateral Optic Atrophy, the Sole Symptom of a Pituitary Growth. This unusual condition is reported by Frederick Krauss.[7] The patient was a man, aged 24, single, gold beater by trade, who complained in July, 1913, of failing vision in the left eye, noticed for three weeks. He had no pain or general symptoms, other than fatigue and sleepiness. He smoked three cigarettes daily, but did not drink intoxicating liquors. He had a slight cold in the head, but no headaches.

One cousin had goiter. His father had always been a heavy drinker of beer; mother—good health. One brother died at the age of 2 years, after suffering from purpura beginning at the age of 7 months. One brother at the age of 18, having been treated for tuberculosis for over one year, developed enlarged glands in the neck, and died rather suddenly. The postmortem showed enlarged glands all over the body. The liver and spleen were similarly affected. Another brother died at the age of 21 suffering from Hodgkins Disease.

The history states:

"Patient had always enjoyed good health, being active in outdoor sports. He is physically well developed, about 5 ft. 9 in., weight 160 lbs. There are no marked enlargements of hand or foot, or other indications of acromegaly. Glandular swellings are absent. When first seen the vision of the right eye was 5/6, and in the left eye excentric vision only. The cornea was clear in both eyes, the pupils responding equally and freely to light, accommodation and convergence. In the right eye the

(7) Ophthal. Record, February, 1916.

fundus was normal. In the left eye the media were clear, the optic nerve grayish, decidedly off color, but not atrophic. The vessels were normal in size, the retina normal, except in the macular region, which appeared

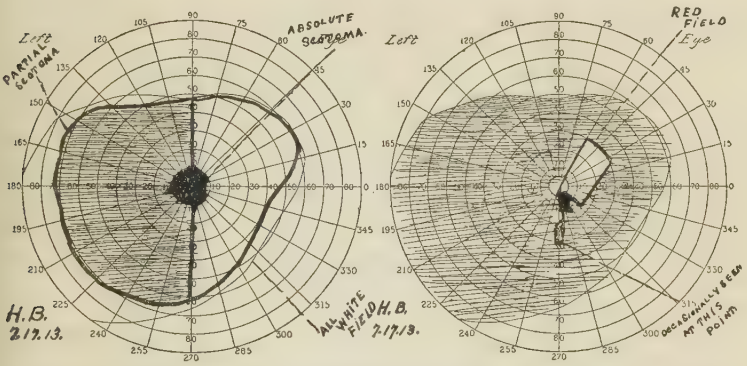


Fig. 18. Unilateral Optic Atrophy from Pituitary Growth. Fields of Vision.

slightly fluffy. The field of vision in the right eye was normal. In the left eye there was a temporal hemianop-

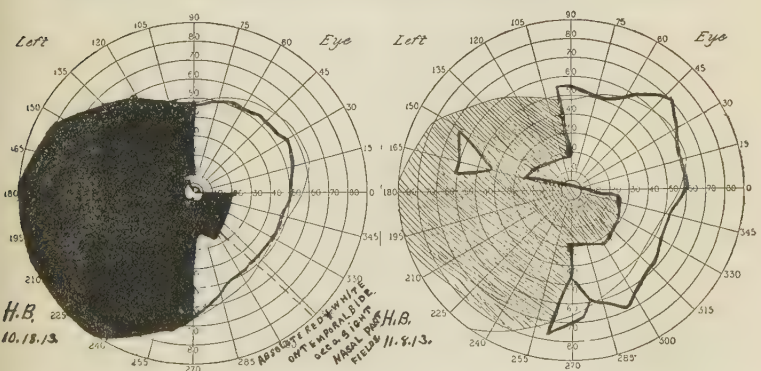


Fig. 19. Fields of Vision in Unilateral Optic Atrophy Due to Pituitary Tumor.

sia in the scotoma of which, large white objects could be dimly seen. There was an absolute central scotoma of 10 degrees, except to the nasal side where it was about

8 degrees. The red field occupied a small irregular area on the nasal side. The nasal sinuses were apparently normal (Fig. 18). On July 9, the vision in the left eye was 4/40, the right eye 5/6. An examination

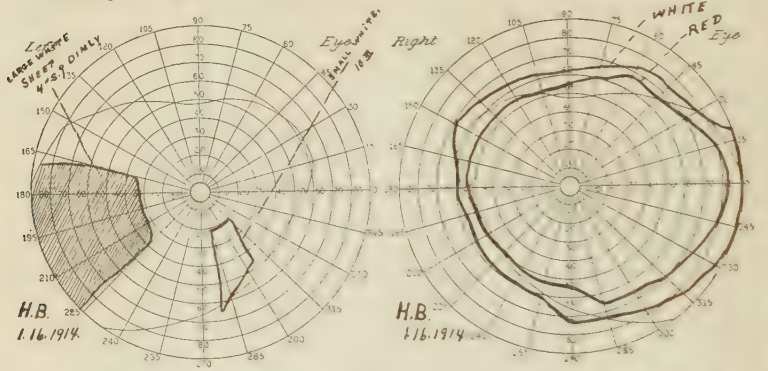


Fig. 20. Fields of Vision in Unilateral Optic Atrophy Due to Pituitary Tumor.

of the nasal sinuses failed to disclose any cause for the nerve lesion. The distinctly unilateral character of the affection and absolute absence of general symptoms were

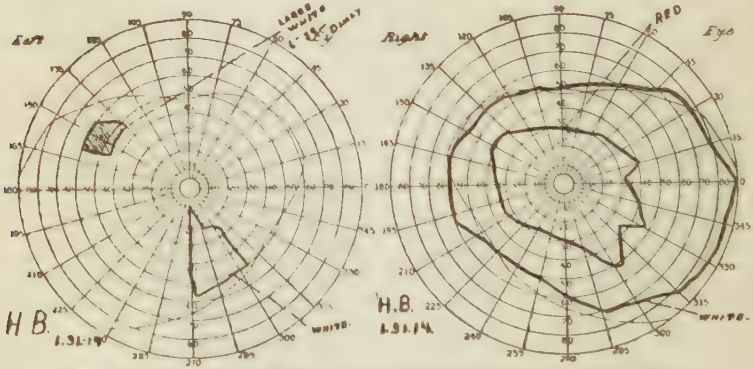


Fig. 21. Fields of Vision in Unilateral Optic Atrophy from Pituitary Disease.

mystifying to his physician and myself, until the *x*-ray examination showed considerable enlargement of the sella turcica. Wassermann tests were negative.''

The patient's general health was excellent. He was given the mixed treatment by his physician, under whose observation he continued.

Under faradic and galvanic stimulation the vision in

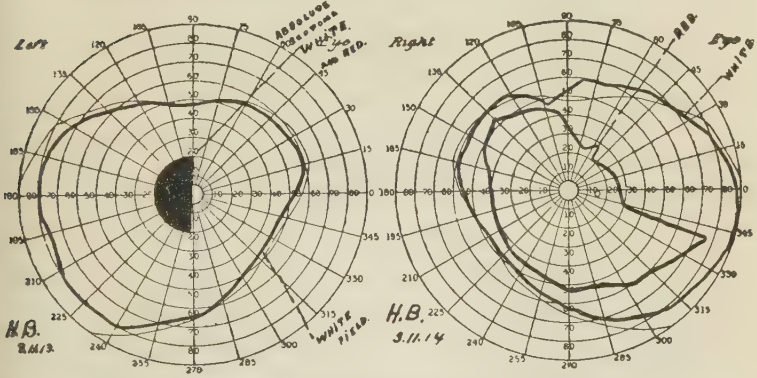


Fig. 22. Unilateral Optic Atrophy Due to Pituitary Disease. Visual Fields.

the left eye gradually improved to 5/12, with the peripheral field nearly normal, a large absolute scotoma remaining to the temporal side of the fixation point.

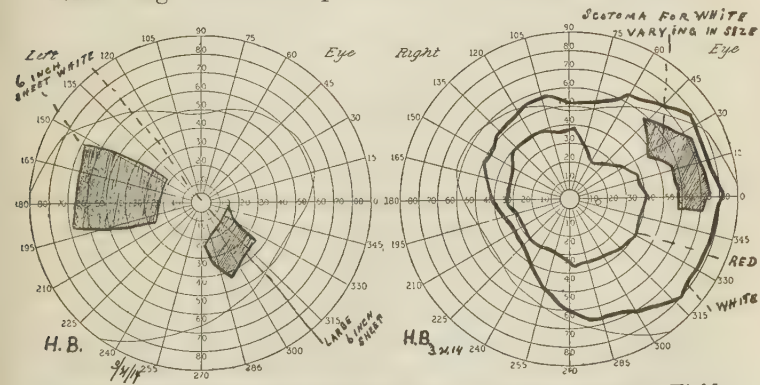


Fig. 23. Unilateral Optic Atrophy from Pituitary Disease. Fields of Vision Before Operation.

On August 1, the vision was 5/15, the patient stating that his vision in the left eye fluctuated greatly, being very good at times. On Sept. 6, 1913, the vision

in the right eye was 5/5, in the left eye 5/9 partial. He was able to recognize small colored lights 10 mm. in diameter at 5 meters. He was seen again on Oct. 18, 1913, when the vision in the left eye had dropped to 5/20. The optic nerve was very pale with beginning atrophy. The field of vision showed an absolute temporal hemianopsia with encroachment upon the nasal side below fixation. The right field was normal (Fig. 19).

He was seen again on Jan. 17, 1914, when the optic nerve was seen to be gray-white, markedly atrophic with some contraction of the vessels.

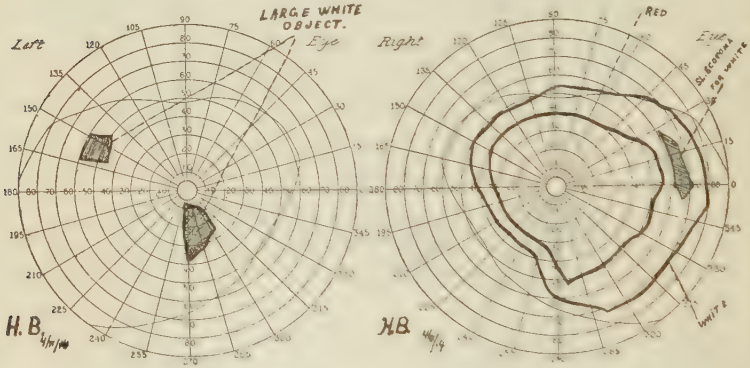


Fig. 24. Unilateral Optic Atrophy from Pituitary Disease. Fields of Vision Ten Days After Operation.

The retina was normal. The field of vision was reduced to a small area down and to the nasal side, with faint visual perception of large objects to the temporal side near the lateral periphery. In the right eye the vision was 5/3, with full visual field especially red. The visual field in the left eye had gradually decreased (Fig. 20). Early in February, the patient noticed that there was a marked loss of hearing in his left ear. He thinks that he has always had slightly less hearing in the left ear, but is uncertain as in 1909 he successfully passed an eye and ear examination for a railroad position.

The hearing in the right ear was watch at 30 inches. In the left ear, it was barely heard on contact. Hearing

was not affected by Politzerization. Ear drums were practically normal in both ears, showing no atrophy or marked retraction.

"The tuning fork on vertex is heard only in the right ear. Bone conduction is much less than air conduction. The duration of sound in bone conduction is very much less than normal, the tuning fork being heard when placed on the opposite mastoid, long after it had ceased to be heard on the left side. Therefore the Weber, Rinné and Schwabach tests indicate a nerve lesion of the sound-perceiving apparatus of the left ear.

"The patient has been steadily employed, and aside from his left eye, he feels that he is in perfect health."

A study of this case presents a family history of enlargement of the lymphatic glands and a blood dyscrasia. There is evidence of a growth of the pituitary body with great enlargement of the sella turcica. The only pressure symptoms are those of the eye and lately of the ear. Sleepiness and sexual apathy are very slight. The patient feels in excellent health. The patient claims to have some difficulty in lacing his shoes in the morning, but he still wears the same size shoes and gloves. There was no increase in weight or height. The pressure of the growth caused at first a temporal hemianopsia on the left side, with some diminution in vision in the opposite eye. Through temporary relaxation of pressure, perhaps assisted by the mixed treatment and electric stimulation of the optic nerve there was a temporary increase of the vision lasting several months. Then the pressure reappeared with almost complete loss of sight in the left eye. The right eye in a recent field shows a slight cutting of the red field, though the form field is still perfect. The involvement of the auditory nerve would indicate a downward and backward extension of the struma, causing pressure.

The visual fields in this case are most characteristic. Beginning as a temporal hemianopsia in the left eye, and with absolute central scotoma for all colors it improved greatly under treatment. Colors could be recognized, though a paracentral scotoma remained. The distant vision naturally improved, likewise. There was

a characteristic instability of vision, varying from hour to hour.

A sudden extension of the tumor with its increased pressure caused a reappearance of the temporal hemianopsia with involvement of the nasal field from the center, toward the periphery, which is characteristic of the optic atrophy due to a chiasmal lesion.

After prolonged ineffectual treatment with thyroid extract the patient was operated on, under local anesthesia, by the two-step method and the submucous resection route. The condition just before operation is shown in Figure 23.

The exsected tumor "consists of masses of blood-clot, fragments of dura and small bits of hypertrophied pituitary tissue. Fragmentation renders description difficult, blood spaces are seen and many acini containing colloid. The prevailing type of cell is the scyanophilic, hence the tissue is from the periphery of the anterior lobe of the pituitary. Also there are many small refractile bodies scattered throughout all portions of the tissue, having the microscopic characteristics of psammoma bodies."

The convalescence was rapid and uncomplicated until April 12. The field of vision for red in the right field had increased fully 10 per cent on the temporal side, and the relative scotoma for white reduced in size. In the left eye he had color perceptions in the lower nasal quadrant with a small field for white which had been absent at the previous examination (Fig. 24).

On the following night he had a severe headache, becoming unconscious, and dying on April 13 of purulent meningitis.

A study of the fields (Figs. 18 to 24) is very instructive. In July, 1913, there was a large normal field in the right eye with hemiaopsia (partial scotoma) in the temporal side, with an absolute central scotoma reducing vision to hand movements excentrically. Temporary improvement in August was followed by absolute temporal hemianopsia with involvement of the nasal field. A slight improvement in November was followed by complete loss of vision except in isolated regions. In January, 1914, the right field had remained normal until

about the 31st, when the red began to show a cutting to the temporal side. In March the upper temporal quarter of the field for red was much involved. By March 21, 1914, there had developed a beginning scotoma for white in the temporal field. Some improvement is noticed in the last field, taken two days before the patient's death.

Hemeralopia.[8] The frequency of hemeralopia, extremely low in time of peace (1 in 12,000 in France, according to Walter), undergoes an augmentation in wartime. At Verdun, Bourdier found 8.78 per cent. in ocular examinations during the winter of 1914-1915. At the same period, there occurred in the German army a grave epidemic of this condition. More recently, Vejers has observed it in proportion of 10.2 per cent. This high figure depends on many causes, some peculiar to the present war, which presents conditions different from those which have prevailed, in the past, such, for example, as the higher mean age of the combatants. The hemeralopia in the present war differs from those which have been described in previous wars in two respects: In the first place, there has been no epidemic, and the revictualing of the army being satisfactory, there have been no crises of hemeralopia due to privation and physiologic misery. By reason of selection, symptomatic hemeralopia is rarely found more in military than in civil life. In most cases it seems related to some vice of refraction and principally to myopia. The condition has been observed among volunteers in the early months of the war, among officers of the regular army and medical officers, and because of these facts and others contained in the reports of the commanding officers and because of the isolated character of each case, it is evident that, in the present war, hemeralopia is a symptom rarely invoked by malingerers. Except for those cases traceable to general diseases (of liver and kidneys) or to ocular fatigue or disease, there seems to be no satisfactory treatment for the condition.

Primary Tumors and Tumor-Like Formations at the Optic Disc. The following reports by H. Oloff[9] tells

(8) Paris Letter, Jour. Amer. Med. Ass'n., Sept. 9, 1916.
(9) Klin. Monatsbl. f. Augenheilk., p. 313, 55, 1916.

its own story. An otherwise healthy man, aged 22, was mustered for the navy in June, 1912. Half a year later, he noticed that he could not see well with his left eye. As this became worse, he came to the hospital towards the end of 1913. V = 6/20, due to a swelling of the optic disc, which did not change within seven weeks. In April, 1914, V. was reduced to 1/30 eccentrically. A circumscribed greyish white, vascular tumor projected (6 D.) into the vitreous, the surrounding retina was slightly edematous, opaque, and showed very small white dots and radial streaks, probably the expression of folds of the innermost layers. Wassermann reaction was negative, no local tuberculin reaction. In spite of inunctions of iodide of potash and the tuberculin treatment, continued for months, the tumor grew and V. was only fingers at 1 m. eccentrically. As there was suspicion of a malignant tumor, the eye was enucleated in July. Since then, a year after the operation, no metastases have occurred. Gilbert, Munich, to whom the eyeball was sent for anatomic examination, reported a tumor projecting 3 mm. into the vitreous. It showed a steep nasal and a flat temporal decline. The nasal portion was vascular; the temporal portion anemic. It extended to the lamina cribrosa and had a grey color. The macroscopic diagnosis was sarcoma.

The literature shows that only four cases of primary tumors of the optic disc have been observed, aside from tuberculosis and lues, which are also rare. Characteristic of the described cases and the present case, was the lack of all external signs of irritation, while tuberculous and the majority of gummatous tumors of the optic disc are complicated by more or less severe external irritation of the eye. Sarcoma seems to be the predominating form of primary tumors of the optic disc. They seem confined to young subjects and to be relatively benign, as metastases were never observed.

THE OCULAR MUSCLES.

Heterophoria in Children. The late Wendell Reber[1] leaves a valuable paper on this rather neglected subject.

(1) Jour. Amer. Med. Ass'n., July 15, 1916.

He regards heterophoria in children as a reasonably rare anomaly. The references to it in the literature are of the most cursory kind. Of statistics there are none. In the hope of establishing some kind of statistics he had his private case records gone over with the following results: In the last twenty years, refraction was done in 6,400 cases. Of this number, 2,000 presented some manner of muscular anomaly. Many of the latter class were made so comfortable by their refractive correction alone that no especial attention (except for purposes of record) was directed to the muscular anomaly. Of these 2,000 muscular anomalies, representing all ages, 345 occurred in children up to but not including the fifteenth year. Of this 345 there were thirty-five, or about 10 per cent., whose muscular status became of moment and demanded treatment for the muscular condition itself. This has no reference to strabismus in children, which is familiar to all ophthalmic workers. The cases were true heterophorias in that the children all enjoyed binocular vision, but were sufficiently hampered by their muscular imbalance to present quite an array of symptoms.

After a careful study of the 345 cases Reber summarized his experiences as follows: Three esophorics out of eight were made comfortable on weak prisms, bases *out,* in their permanent correction.

Five other esophorics had hyperphoria and wore vertical prisms. Three of them were cured by this method, one was improved and one was not helped a bit.

Eleven exophorics out of twenty-four were made entirely comfortable on prism training alone plus the wearing of their respective corrections when needed. Three more had prisms of from 1 to 3 degrees, bases *in,* incorporated in their regular correction, and also needed prism training to complete the cure. Three more had permanent prisms only in their corrections, as nothing could be hoped for from their parents in the matter of coöperation. Seven had hyperphoria, of which number, two improved so much on training of their convergence as to render lateral vertical prisms unnecessary. The other five had sufficient vertical disturbance to compel attention and were treated from that standpoint.

Of fifteen hyperphorics, two were paretic. One was operated on successfully, and the other quite as successfully treated with vertical prisms. Five of them became so comfortable on prism correction of the lateral error that the vertical imbalance was ignored. Eight of them were intrinsic nonparetic hyperphorias that called for prism intervention, and all of the eight are wearing vertical prisms, six being completely cured and the remaining two in a fair way to live up to the visual requirements demanded by modern education. No esophorics came to operation. Two exophorics came to operation. Two hyperphorics came to operation.

Reber concluded that: (1.) Heterophoria in children is in a certain proportion of cases an entity which must have some kind of attention.

(2.) Painstaking consideration of all the general physical factors is most imperative.

(3.) Thoroughgoing correction of the refractive status is imperative, but in some cases it is merely "first aid."

(4.) Esophoria when intrinsic will probably be best met with weak prisms (from 1 to 2 degrees), bases *out,* plus lateral rotation exercises.

(5.) Exophoria when intrinsic will often respond to training alone, frequently will need prisms, bases *in* (from 1 to 2 degrees) for permanent use, and rarely comes to operation.

(6.) Hyperphoria when intrinsic almost always demands vertical prisms of from one-third to one-half the total infinity deviation, and when paretic will more frequently than any other muscular anomaly justify operative interference.

A Buried Knot in Conjunctival Sutures. For the relief of discomfort and pain, mostly due to the knot in the suture, after operations that require conjunctival sutures, Roderic O'Connor[2] conceived the idea of burying the knot and using an absorbable material such as triple 0 catgut or finely shredded kangaroo tendon (Fig. 25).

The needle (Fig. 25) pierces one margin from underneath, crosses over and pierces the other margin from

(2) Ophthal. Record, March, 1916.

without. As the knot is tied the loose conjunctiva everts easily and when the ends are cut it returns to its normal position carrying the knot with it. The writer prefers kangaroo tendon as it can be made much finer than the

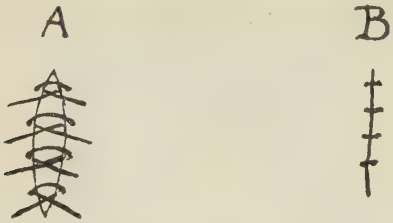


Fig. 25. O'Connor's Buried-Knot Suture. (A) Showing method of passing the sutures. (B) Showing appearance after entire wound is sutured. Entire absence of knots.

finest catgut and is softer. O'Connor has tried this suture in a number of cases of advancement and in one was able to allow the patient entirely to dispense with even a monocular bandage. This patient, a girl of 12, was able to use her eyes without any pain whatever. The same result was obtained in another case of operation on a superior rectus, in which there is usually a great deal of pain from knot irritation.

A Tension Suture for Advancement Operations. Harold Gifford[3] points out that when the *internal* rectus is advanced, the tension on the sutures can be fairly well relieved by the customary practice of putting a stitch through the opposite tendon or a fold of conjunctiva and attaching it to the bridge of the nose or to a thread from the outside of the other eye. But when the *external* rectus is advanced, the eye can not be rotated outward by a thread attached to the internal side of the eye and the skin of the temple, on account of the danger of injury to the cornea.

To meet this difficulty Gifford has for some years been using a suture (ordinary black silk, size D, with two needles) put in as follows: After finishing the advancement operation, a firm hold is obtained with the fixation forceps on the tendon of the internal rectus, and one

(3) Ophthal. Record, March, 1916.

needle is passed through this and through the center of the free border of one lid and out well below the lashes, at about the junction of the middle and the outer third. The other needle is then passed through a corresponding part of the other lid (Fig. 26). The ball is then rotated outward till the insertion of the tendon is about under the points where the lids are penetrated by

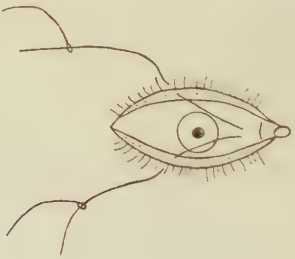


Fig. 26. Tension Suture for Advancement Operations. Advancement Sutures Omitted to Avoid Confusion.

the thread, and the latter is tied just tightly enough to bring the lids down to the surface of the globe. He removes the stitch after from five to seven days. Sometimes it cuts through the tendon by that time.

For picking up the tendon through the uncut conjunctiva, forceps with sharp projecting teeth are desirable.

Since using this tension suture the writer's advancement results have improved decidedly. It will, he thinks, be found of use no matter what form of advancement or tucking may be employed.

Operation for Relief of Palsy of the External Rectus Muscle. A successful case is reported by C. M. Harris[4] who, on March 16, 1915, saw M. R., aged 17, for a left esotropia which proved to be paralytic. The defect was first noticed in infancy and amblyopia in the left eye dated back to her earliest recollection. Examination showed no movement of the left eye beyond the median line of the orbit, but other ocular movements were

(4) Ophthal. Record, July, 1916.

PLATE V.

A. Paralysis of the external rectus. Primary position.—Harris (see page 84).

B. Paralysis of the external rectus. Outward rotation after operation. (Harris.)

normal. In the primary position the strabismus was extreme (Plate V, A).

The vision in the right eye was 6/12 which refraction and the wearing of plus 1.00 sph. plus .25 cyl. axis 90 improved to 6/7.5. With the left eye she saw fingers at one foot which was not improved by the —2.50 sph. indicated by retinoscopy. The irides were active, the media were clear, the right fundus revealed no lesions, but a spot of old chorioiditis was observed adjacent to the temporal edge of the disc in the left eye.

On March 24, 1915, the left eye was prepared for operation, incision through the ocular coverings was made from the temporal edge of the superior rectus insertion, to a like point on the inferior rectus; the convexity of the incision being at the insertion of the palsied muscle, which appeared as a flabby, pale, thin band. The temporal halves of each of the tendons of the vertical muscles were severed from their attachments and split backward for at least one-half an inch, and then sutured to the site of the insertion of the external rectus with black silk; a few other stitches approximated the coverings. A complete tenotomy of the internal rectus was done at this time.

The eyes were padded for about one week and considerable reaction took place, but the patient seemed quite comfortable. Three weeks subsequent to the operation she was discharged with a slight hyperesotropia in the primary position, but had practically full temporal rotation in the affected eye. When seen five months later conditions were the same, but the patient stated that her asthma had been worse than usual during the summer and the consequent depression after attacks, always caused more deviation of the eyes than was noted at other times (Plate V, B).

While absolute, permanent straightness was not obtained, it is possible that subsequent graduated tenotomies might improve matters, but the restoration of temporal rotation should in itself amply recommend the operation.

TOXIC AMBLYOPIA.

Quinine Amblyopia. One of these constantly occurring examples of toxic amblyopia is reported by Louis Levy.[5] About seven months before an adult man took almost a half ounce of quinine in mistake for epsom salts. He first noticed blindness about three o'clock the next morning. For three days he could see absolutely nothing, not even light. After this, vision gradually returned until he was seeing very well, although everything looked smoky. About the latter part of June, vision again failed until he had perception of light. Upon examination Levy found dilated pupils, which did not react to light. The ophthalmic findings at the same time were as follows: Both discs very pale, vessels small, with colloid excrescences found in elderly people. The man was given the following treatment: strychnine, 1-30 gr. t. i. d., amyl nitrite inhalations and general elimination. Later, the blood-vessels seemed larger and the discs not so pale. Vision, however, still remains the same.

Optochin Amaurosis. A case of this rare form of drug amblyopia is reported by W. Feilchenfeld.[6] Five grams of optochin were given to a 20-year-old pneumonia patient in hourly doses of 0.2 grams each. Within two days poor hearing developed, and on the next day there was a decrease in vision. Complete blindness set in on the subsequent day. The pupils were found to be dilated *ad maximum*. The fundi were normal except for a narrowing of the vessels on the disc. Sodium iodide was given in large doses, as well as tincture of strophanthus. Under this treatment there was a gradual recovery, first of the hearing and eventually of the sight. Two months later the corrected vision was 6/6, although there were a concentric contraction of the visual fields and large paracentral scotomata. Hemeralopia and scintillating scotoma gave the patient a great deal of subjective annoyance. The ophthalomoscope showed bilateral optic atrophy.

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(5) Jour. Texas State Med. Ass'n., November, 1916.
(6) Deutsch. med. Wochenschr., Mar. 16, 1916.

Unilateral Wood Alcohol Retrobulbar Neuritis. An example of this unusual form of methyl alcohol amblyopia is reported by H. W. Cowper.[7] The patient was a woman, aged 35, who had been an alcoholic for years. About the end of February, 1916, she drank wood alcohol. Over a period of two weeks she took a "couple of swallows" on five or six occasions, thinking it was gin. There was no doubt as to its having been wood alcohol, because the saloon keeper from whom she bought it knows. He kept it for use externally after bathing. On the day after she took the last "swallow" she became weak, dizzy, and of uncertain gait, and that evening there was a violent attack of vomiting. The next three days she was confined to her bed and seemed so ill that her friends had the last rites of her church administered to her. A few hours after the attack of vomiting she first noticed disturbance of her left vision. She describes it as though black strips were in front of the eye. Very soon this was followed by definite blurring. After a few days the vision improved, but the improvement lasted only a short time when the vision again became worse. Her right eye was never subjectively affected. There never were acute abdominal symptoms such as violent pain or diarrhea.

Cowper saw her for the first time in this present illness on April 18, 1916. R. V. was 20/20, L. V. 20/200. Pupils were equal and active. Ophthalmoscopic examination was negative except that the temporal half of the left nerve was paler than that of the right. During the next two or three weeks the atrophy became well marked and the vision diminished to counting fingers at three feet. The fields taken three months after the poisoning show in the right no abnormality except possibly slight contraction of the blue and red (Fig. 27). In the left there is no contraction of the white but a definite concentric contraction for the colors and a scotoma extending from the fixation point to the blind spot. Upward and inward the scotoma extends not at all beyond the fixation point while downward it goes five degrees and outward fifteen. The scotoma is absolute. Fields were taken in a moderately bright light with one

(7) Ophthal. Record, September, 1916.

centimeter square colors. Fields for yellow and green were not taken, but it was determined that there was no central scotoma for green in the right. Urine examinations have been negative as has also one Wassermann. A nasal examination was made for the especial

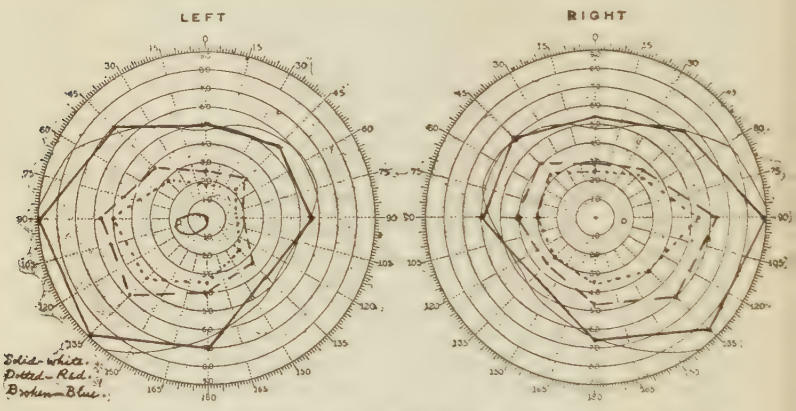

Fig. 27. Case of Unilateral Wood Alcohol Amblyopia. Visual Fields Three Months After the Poisoning.

purpose of excluding if possible sinus trouble, but no abnormal condition was found.

The writer has examined reports of over 200 cases of wood alcohol amblyopia and there was not one in which one eye escaped. This case is possibly unique in that respect and consequently worth reporting.

In many of the cases reported one eye was more seriously damaged than the other. Any explanation accounting for this selective action would apply equally well to such a case as the above.

G. V. A. Birch-Hirschfeld[8] has recently given a full account of the damage to the ocular apparatus by the ingestion of methyl alcohol, in an article reviewed in the *Journal of the American Medical Association* for April 22, 1916.

The writer says that quite a number of cases of methyl alcohol poisoning have occurred recently in soldiers, and

(8) Med. Klinik, Feb. 27, 1916.

not infrequently it has entailed severe and permanent injury of the eyesight. He has compiled a total of 235 cases, not including those that terminated fatally before the eyes were examined. He refers to the 163 cases of poisoning from methyl alcohol at the Berlin municipal lodging house three years ago, when seventy-two persons died and four were left permanently blind. This experience is recalled to show the difficulty of differentiating the trouble, as the symptoms were ascribed to meat poisoning at first. A number of lives would have been saved if the true cause had been suspected earlier. He reports two cases of blindness from this cause he has recently encountered, in one case proving permanent. In the other case vision improved to 6/18 and the fundus findings grew normal. Patillo described two cases in which blindness came on from four to fourteen days after varnishing the inside of beer casks with varnish dissolved in methyl alcohol. Inhalation of the fumes was evidently responsible in these cases, and Hirschfeld thinks this was a factor in the cases attributed by Wood and Buller to absorption through the skin. The symptoms do not develop until after several hours or days, and then involve the digestive apparatus, with nausea, dizziness, vomiting and headache, progressing rapidly to delirium and convulsions. Usually vision becomes impaired before the general symptoms mask the clinical picture. The dilated rigid pupil suggests impending trouble. If the ophthalmoscope reveals optic neuritis, this is a clue to the diagnosis, but it has no pathognomonic features. At the same time, methyl alcohol poisoning should always be suspected when, along with gastro-intestinal symptoms suggesting poisoning, severe disturbance in vision develops suddenly, with central absolute scotoma and contraction of the peripheral field of vision, and the ophthalmoscope shows optic neuritis. The contraction of the peripheral field of vision usually subsides soon, but the scotoma may persist a long time. The prognosis, he thinks, can be estimated from comparison of the findings in the visual field and fundus, and the visual acuity for a few weeks. So long as the visual field keeps enlarging, the process of recuperation is not ended, as also when the absolute scotoma changes

to a relative. Even in the mildest cases, more or less impairment of vision is entailed, resembling the symptoms of chronic alcohol-tobacco amblyopia. Disturbances in vision from quinine, atoxyl and arsacetin are by limitation of the visual field, central vision persisting good. With meat and fish poisoning the eye is affected by paralysis of the muscles. Male fern amaurosis alone seems to present the same symptoms as those from methyl alcohol. The ophthalmoscope findings with uncomplicated uremic amaurosis are normal. He regards the fate of the eyes with methyl alcohol amaurosis as usually sealed by the time the patient reaches the physician, and is very pessimistic as to benefit from any measures in treatment. The main point is to recognize its nature promptly and ward off similar injury from others that may be exposed. Prompt identification of the cause combined with energetic measures may avert further harm. The methyl alcohol induces rapid degeneration of the nervous apparatus of the eye, affecting the cones of the retina more than the rods, the same as ethyl alcohol, nicotine, thyroidin and carbon bisulphide, while atoxyl and allied substances affect the rods while sparing the cones. There is nothing to indicate inflammatory infiltration in either type.

[In spite of the efforts of State and Federal authorities in conjunction with the endeavors of national societies for the prevention of blindness to prevent the potable use of wood alcohol preparations, deaths and blindness from this poison still continue. Until the authorities see their way clear to prohibiting the general sale of Columbian Spirits and similar poisonous preparations of methyl alcohol, both wholesale and retail parcels of this agent should at least bear a conspicuous poison label.

It seems strange that the laity still persist in buying and using a deadly poison, when an innocuous substitute, namely, *industrial alcohol,* which answers every purpose of the lethal Columbian Spirits, can be had just as easily and, as a rule, more cheaply.

As an illustration of the wood alcohol intoxications generally going on in this country, the following extract from a local newspaper has recently been sent the Editor of this Volume by Dr. E. C. Ellett, of Memphis, Tenn.

In this case the substitution of wood alcohol for ethyl alcohol as a bay rum solvent was the cause of the tragedy.

"Conway, Ark., March 31, 1916.—Two men are dead and one is dying in a local hospital as the result of a night orgy in bone dry territory in which *bay rum* played the principal part, a quart of the poison having been consumed by the three at a party in Andy Francis' barber shop. The dead are Homer Lewellyn and Orfie Douglas, both chauffeurs.

The third member of the party is Andy Francis, the host, who, according to physicians, has practically no chance for recovery. He rallies at intervals and then collapses, and news of his serious condition has not been communicated to his wife.

Lewellyn was the first of the two to succumb to the fatal effects of the wood alcohol, which, it is said, had been ordered by Francis for the party. It is understood that a half dozen were in the barber shop when the drinking began, but so far only four are known to have suffered ill effects, the other members having quit the party without drinking.

Lewellyn and Douglas were found in a critical condition. They never regained consciousness. Accidents kept two other men who had been invited from attending the fest. Substitution of wood alcohol for grain alcohol in the composition of the bay rum is given by physicians as the cause of the tragedy.

—Ed.]

GLAUCOMA.

The Indications for Operation in Glaucoma. It is perhaps well that in the trend of opinion favorable to *operative measures in glaucoma* one should not forget the non-operative side of the subject. This W. C. Posey[9] has well considered in a brief summary of the indications for operation in primary glaucoma as follows: 1. In all cases of acute and subacute glaucoma and in all chronic cases on the manifestation of any inflammatory glaucomatous symptoms. 2. In all cases of chronic glaucoma in which there is doubt of the patient's coöperation in the persistence in the miotic treatment through the remainder of life; this includes practically all hospital cases and such private patients as may be of a weak and vacillating disposition. 3. In all patients with chronic glaucoma who reside at such a distance from proper ophthalmic care that they are unable to report at sufficiently frequent intervals for the super-

(9) Therapeutic Gaz., Feb. 15, 1916.

vision necessary in the proper and safe carrying out of the miotic treatment, or for operation in the event that inflammatory symptoms arise. 4. In chronic cases in which the individual is under 55 years of age, when the field of vision and central vision are good, an operation on the more affected eyes is advised, miotics being employed in both the operated and unoperated eye for the remainder of life. Operation on the second eye should follow, if subsequent observation shows that vision is maintained better in the operated than in the non-operated eye. 5. In all cases of chronic glaucoma, without regard to age or the development of the disease, in which miotics have been given a faithful trial for at least six weeks or two months, as evidenced by the constant maintenance of pupillary contraction to almost pin-point size, and in which vision and the field of vision show progressive deterioration.

Cyclodialysis is preferred in all cases in which operation is demanded if there be a hemorrhagic tendency or the field of vision is very much reduced. Iridectomy is reserved for all other cases. The trephining operation has been relinquished, as it appears to be a more dangerous procedure than iridectomy, on account of the opacification of the lens which follows in not a few cases, either immediately or remotely after the operation; furthermore, even in cases in which these complications do not arise, it has not been proven that the visual results after trephining are any better than those obtained by a properly executed iridectomy.

In all cases not included under the five headings given above, miotics should be employed with great zealousness and persistence four times during the day. The maintenance of vision by this method does not warrant the gloomy prognosis which is so often rendered in cases of chronic glaucoma.

Corneoscleral Subconjunctival Seton in Glaucoma Simplex. In presenting a *modification of the Zorab subconjunctival seton and the corneoscleral seton of Casey Wood* K. K. Wheelock[1] believes that his method simplifies both these procedures and renders them more effective. What the ultimate effect of a sterile thread lying in the

(1) Ophthal. Record, February, 1916.

anterior chamber may be we have no means of knowing, but we do know that the ultimate effect on the eye of unrelieved pressure within is blindness and probable loss of the eyeball. There seems no good reason to doubt that a thread lying in the anterior chamber of the eye according to the method about to be described might effect the end in view, *viz.*, permanent drainage by creating a fistulous tract in the tissues, and in case of untoward effects arising from the pressure of a foreign body the thread may be easily removed.

The initial entrance into the anterior chamber is made as in the Herbert operation, *i. e.*, the conjunctiva is dissected from the sclera down to the corneoscleral margin, thus leaving a subconjunctival pocket. A Graefe cataract knife is passed through the subconjunctival pocket into the sclera 1 mm. behind the corneoscleral margin and into the anterior chamber, the incision so made should be four mm. in length. A Riverdin needle is next passed through the subconjunctival pocket into the anterior chamber and through the incision previously made by the cataract knife. The Riverdin needle made for the author by V. Mueller & Co., Chicago, has a very sharp point and a double cutting edge, so that the minimum of trauma is caused. The needle is a quarter curve and passes through the cornea closed. The eye is then opened by the thumb-push in the handle and an assistant lays a loop of "00" braided white silk thread in the opened eye, as shown in Fig. 28. The eye of the needle is then closed, and the needle, loaded with the thread, is withdrawn.

When the needle emerges from the subconjunctival pocket the eye is opened and the loop of thread disengaged from the needle. The double thread now lies in the subconjunctival channel and anterior chamber with the double loose ends upon the cornea; the loose ends are now cut off flush with the cornea and the double thread is drawn into the anterior chamber, and as much of the thread may extend into the anterior chamber as seems advisable. The conjunctiva may be closed over the loop of thread in finishing the operation.

If it is advisable to have a larger size thread than the "00" in the wound it may be introduced in the following

manner: After the "00" thread has been placed in position and before the distal ends lying upon the cornea have been cut, the loop end in the subconjunctival pocket may be threaded with any desired size thread; then by seizing the loose ends of the thread lying upon the cornea, the second loop may be drawn into position in

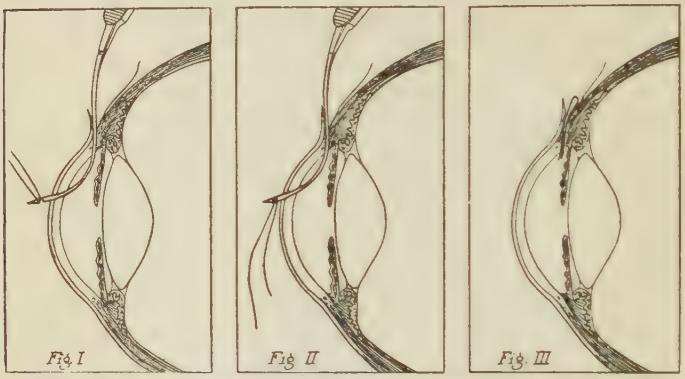

Fig. 28. Wheelock's Corneoscleral, Subconjunctival Seton in Glaucoma Simplex.

the anterior chamber and one thread lying upon the cornea cut flush with the corneal surface; traction upon the larger loop will draw the first loop into the anterior chamber, when the short end of the "00" loop will become free and slide through the second loop and may be drawn through the corneal wound. By gentle manipulation the larger loop may be drawn as far into the anterior chamber as is deemed necessary to secure open drainage and maintain a fistulous tract.

Glaucoma Simplex and the "Mule Shoe" Drain. A. E. Prince[2] describes an ingenious method of *maintaining drainage of the eye in simple glaucoma.* He bases his belief in the efficacy of the operation on the results obtained in thirty-three cases.

The *operation* is usually performed under local anesthesia following an injection of morphine sulphate,

(2) Ophthal. Record, October, 1916.

gr. ¼, scopolamine, gr. 1/100. The antiseptic employed is mercuric biniodide 1/2000.

The superior rectus is grasped by a special forceps (Fig. 29) by which the lid is elevated and held in that position throughout the operation. The conjunctival incision is made parallel and 6 mm. removed from the limbus, which it does not approximate at any point. The lower lip of the incision is next grasped with toothless forceps and separated by scissors down to the limbus. The capsule of Tenon is also incised to permit infiltration into the subcapsular space. The loosened conjunctiva is then drawn over the cornea and undercut with dissecting keratome to expose the limbus (Fig. 30).

A shoulder trephine is placed exactly over the limbus. The object of this procedure is to get a clean cut 1.5 mm. in diameter so that on the removal of the trephine the button of sclera and also the iris will be projected out of the opening. Should the trephine not cut out the button it is dissected out by the point of a very sharp cataract knife. An iridectomy is next made in the usual manner.

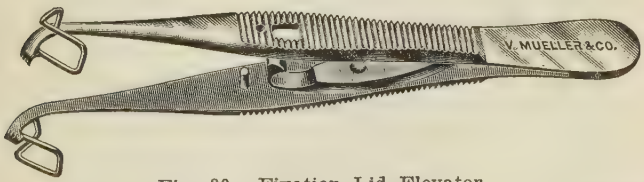

Fig. 29. Fixation Lid Elevator.
The instrument simultaneously depresses the cornea and raises the upper lid.

The drain is then grasped by a "jewelers" pliers and shaped so that the toe is at right angles to the ring. The wire constituting the ring is so delicate that it easily gets out of shape, therefore requiring attention the last thing before insertion. The toe is made to rest vertically in the trephine opening while the position of the ring conforms to the surface of the sclera.

The conjunctiva is now replaced in position over the drain. A conjunctival overcast suture is inserted as shown in Figure 31. In practice the suture is usually inserted and left loose, the drain is inserted and the

Fig. 30. Instruments for Placing the Mule-Shoe Drain. Cut 1, dissecting keratome. Cut 2, shouldered trephine.

ends of the suture drawn tight as the final step. The eye is kept closed and bandaged for three days to permit a clot to fill the trephine opening and hold the drain in position.

The drain was originally made in the shape of a horse shoe. It was found advantageous to unite the heels of the shoe, after which a patient suggested the resemblance to the mule shoe, which consists of a ring surmounting a projecting toe; hence its name.

Originally the toe consisted of a loop of the wire. It was found that the infiltration had a tendency to lift the toe out of the opening. By shaping the toe to resemble a key-stone this result was overcome. Subsequently a solid gold toe was substituted (Fig. 32).

The circular ring by which the toe was prevented from penetrating deeper into the eye was originally made from the smallest wire obtainable, which was 20/1000 of an inch in diameter.

The presence of the ring, resting under the conjunctiva, caused no discomfort, (one of these wires has been worn eighteen months) but it was found that in some cases there was a slight ptosis, and also a tendency to cause the conjunctiva to be absorbed over the wire, thus exposing the wire. This was overcome by having a special tool made by which the wire was drawn down to 6/1000 of an inch. Since this change was made no tendency to cut out has been found.

Nos. 5-6-7 represent some special types of drain which have been made

to satisfy the thought that the use of a thread would be an auxiliary advantage. For obvious reasons they have not been tested out by the author.

No. 4, with a solid toe, represents the type of choice.

To most minds the idea of leaving a metal drain permanently in the eye is at least a surprise. The first thought is that it acts as an irritating foreign body. On second thought one realizes that an antiseptic foreign body is usually tolerated, even in the brain.

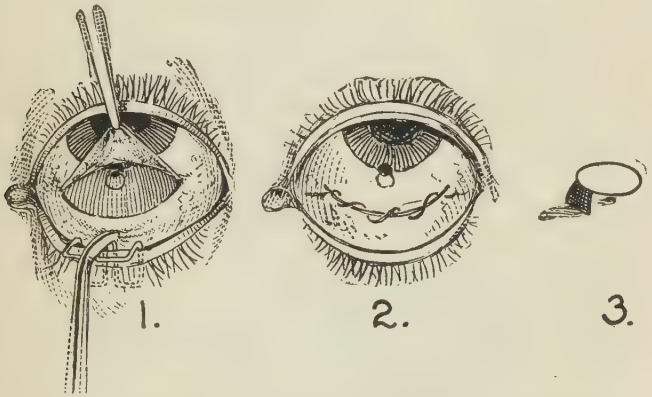

Fig. 31. Showing the Evolution of the Mule-Shoe Drain. Cut No. 1, the drain in situ. Cut No. 2, method of suturing the incision. Cut No. 3, the drain itself.

In the case of a metallic drain in the eye it is observed to cause no reaction and except for the explanation the patient would have no knowledge of its presence.

For the first week or two the drainage is free and the conjunctiva is slightly elevated for some distance about the opening. During this period the wire is often invisible, not from injection, but because of the edema.

Later the ocular wire becomes quite apparent by supporting the lid and directing the eye downward (Fig. 31).

In only one case out of thirty-three has there been anything to render the key-stone portion visible in the anterior chamber. It does not project much beyond the membrane of Descemet and does not show. In the one

exceptional case a little coagulated exudate can be seen at the point where the key-stone penetrates the anterior chamber. This was watched several months and did not increase or decrease.

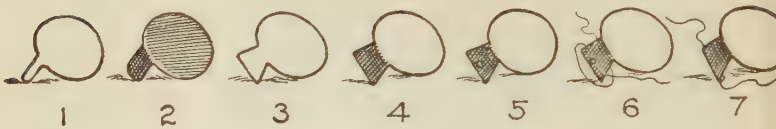

Fig. 32. Prince's Mule-Shoe Drain.

The length of time during which most of these drains have been worn is still too short to justify a positive expression of opinion, regarding the permanency of drainage. So far as the writer's experience enables him to judge, the permanency of drainage is satisfactory.

[In a recent letter, Dr. Prince announces that he has some doubt as to the efficacy of this method in certain forms of glaucoma and promises a supplementary report.—Ed.]

Progressive Hydrophthalmia. Bard[3] is convinced that the condition of the eye known as buphthalmia is connected with some congenital malformation, and that it belongs in the same category as cystic disease of the kidney or breast, hydrocephalus and certain forms of syringomyelia. The term "infantile glaucoma" is not appropriate; in a recent case encountered the tension was below rather than above normal. In all these cases of idiopathic enlargement of hollow organs, any inflammatory features are surely secondary. Cystic disease of the breast and kidney, likewise, have nothing to do with inflammation or a new growth unless secondarily. They are all more like a vascular angioma, some malformation in quality or structure, rather than shape of the wall allowing it to stretch without any pressure from within. This same explanation applies to certain cases of dilatation of the bronchi or segments of the digestive apparatus. In a recent case, idiopathic dilatation of the rectum occurred just above the normal anus, with

(3) Rev. méd. de la Suisse Rom., February, 1916; abstracted in the Jour. Amer. Med. Ass'n., Apr. 8, 1916.

no kink nor stricture to explain it otherwise. In another case the bladder, ureters and the pelvis of both kidneys, in a youth of 16, stretched in this way, gradually entailing atrophy of the kidneys and finally death from uremia, without anything being found during life or after death that could have presented an obstacle to the voiding of the urine and thus have explained this essential cystohydronephrosis. This anatomic-clinical type is to the urine excreting apparatus what polycystic degeneration of the kidney is to the glomeruli-tubuli secreting system.

Modified Elliot Operations for Glaucoma. J. G. Huizinga[4] describes the following *modification of sclero-corneal trephining:*

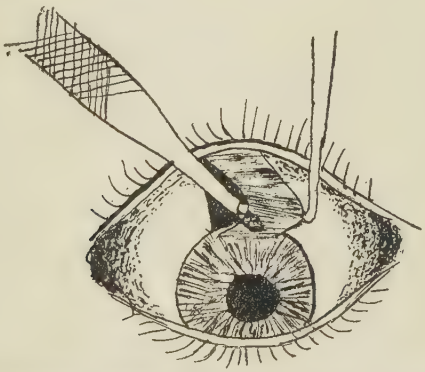

Fig. 33. Huizinga's Modified Elliot Operation. Flap Raised on Hook and Trephine in Place.

After the usual preparation, cleansing and cocaine instillations, two parallel conjunctival incisions are made from the limbus extending upward for approximately 3/8 of an inch. This is dissected away from the eye ball allowing both the upper end and the lower end to remain united as indicated in Figure 33, instead of cutting it away and forming the ordinary flap described by Elliot.

The next step is to take a strabismus hook and inserting it underneath the bridging conjunctival flap near

(4) Ophthal. Record, August, 1916.

the limbus lift it away from the eye ball toward a point located a few inches in front of the center of the cornea and to one side. A specially designed knife is used to split the cornea as illustrated in Figure 34. In splitting the cornea special care must be exercised so as not to button-hole the flap.

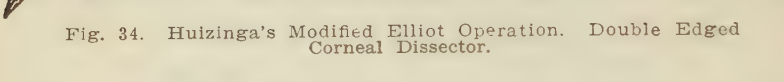

Fig. 34. Huizinga's Modified Elliot Operation. Double Edged Corneal Dissector.

The flap is drawn to one side and the trephine inserted slightly on a slant. The button is excised and the iridectomy is performed as indicated in the left eye of the photograph. The flap being attached both above and below requires no stitching. It is merely spread out with a spatula so that the edges co-apt.

The photograph shows very poorly the result of the Elliot operation as modified by the writer's method in the left eye. The advantage of a good iridectomy in addition to just trephining the sclerocornea is so manifest that it should never be omitted. The figure shows a triangular iridectomy just above the left pupil with its base at the root of the iris. This, of course, is covered by the upper eyelid and does not affect the vision. In the case illustrated in Figure 33, Huizinga had an opportunity to compare the two operations and the results obtained in this patient are certainly in favor of the modified Elliot operation as described above.

There are no disadvantages in this operation except, perhaps, a slightly more difficult technique. Its advantages are: No suturing is required and therefore it takes less time; a flap that will positively stay in position and, therefore, a more rapid healing; no irritation due to the presence of sutures and consequently less post-operative congestion; since there is a more perfect placement of the flap, rapid healing and an absence of all sutures there must be less danger from post-operative infection.

Late Infection Following the Corneoscleral Trephine Operation for Glaucoma. Recently two cases of

late infection of unusual severity *following scleral trephine operations* have been seen by C. B. Broder.[5] The histories are as follows: Case 1. J. S., aged 35, was first seen by Broder in March, 1915, when he came to have his glasses for reading changed. Examination showed evidence of a trephine operation combined with an iridectomy in each eye, which had been performed three years previously. The left eye had very little vision, hand movements at five feet. The nerve was pale, atrophic, and there was a deep depression. There was no increase of tension. In the right eye vision was 20/30 with correction plus 1.00 spherical. Disc was slightly cupped. Tension was 22 mm. Hg.

The patient was not again seen by Broder until April 15, 1916, when he went to the office and said that while working at his trade some aniline pigment got into his right eye and he rubbed it to allay the irritation. He awoke the next morning with the lids stuck together, and the eye inflamed and painful. On examination the eyeball was found deeply congested and over the trephine opening was a raised and circumscribed yellowish mass. There was a distinct exudate in the anterior chamber. The upper part of the cornea near the flap showed a superficial ulceration and the rest of the cornea was dull. The fundus could not be seen. Vision was reduced to light perception and tension was normal. Under treatment the hypopyon gradually disappeared and the cornea cleared up, revealing an active irido-cyclitis with opacities in the vitreous and deposits in the pupillary area and around the lens.

The patient was kept in the hospital for seven weeks and the inflammation slowly abated. At present, vision is greatly reduced (5/200) on account of the floating vitreous opacities and the altered condition of the lens.

The intra-ocular inflammation in this case was evidently secondary to the corneal ulcer, the infection involving the conjunctival flap and spreading to the ciliary body through the scleral opening.

Case 2. M. R., aged 52, was first seen by Broder June 15, 1916, and at that time stated that the left eye had been enucleated three years previously following

(5) Med. Record, Oct. 21, 1916.

two operations for glaucoma, and the right eye had been operated on shortly after for the same disease with the preservation of good vision. Three days before the next visit, the remaining eye suddenly became painful and red and the vision foggy. An examination showed acute conjunctivitis with infection of the interior of the eye. The site of the flap over the trephine opening was obscured by a yellowish elevated bleb. Hypopyon was present. Signs of a severe iridocyclitis were visible, fibrinous deposits in the pupillary area, and on the surface of the lens capsule and opacities in the vitreous. Very little vision was present. The infiltrate in the anterior chamber disappeared in a few days, but the infection of the conjunctiva and ciliary body was obstinate and persisted for several weeks in spite of rigid treatment.

At the time of discharge from the hospital, the inflammation had subsided, but the vision, due to the iritic deposits on the lens and the vitreous opacities, was greatly reduced, the patient being barely able to find his way about.

The unfortunate outcome in these two cases, the infection in each instance involving the remaining good eye and leading almost to total loss of vision, together with the increasing number of cases being reported of secondary complications following the trephine operation for glaucoma, should teach us, Broder says, to be guided in our prognosis concerning the ultimate outcome, and to use this method of procedure only as a last resort.

Besides late infection other pathologic conditions following the trephine operation have been reported, such as opacification of the lens, and closure of the trephine hole by proliferation of connective tissue, or by being blocked by iris, ciliary body, suspensory ligament or lens. In acute and subacute glaucoma the consensus of opinion seems to favor the ordinary iridectomy as the operation of choice. In glaucoma simplex, the miotic treatment should be persisted in as long as the intraocular pressure is controlled, and the visual field and central vision are not on the decline. A majority of these cases will yield to therapeutic measures.

Trephining in Buphthalmos. When Harold Gifford[6] saw the admirable results of Elliot's trephining in chronic glaucoma buphthalmos seemed to offer an ideal field for the operation, since on account of the great width of the limbus, the only serious difficulty of trephining, that of getting far enough into the cornea without button-holing or making the flap too thin, would be absent. But he got a poor result in each of the two cases of buphthalmos in which he did a trephining.

One was a typical two-sided case in a boy of about 5 years. The other a one-sided case of moderate degree in a woman of about 35. In both the operation itself was as easy as possible, but the reaction was somewhat prolonged and final result, so far as improvement went, was *nil.* No distinct bleb formed and the tension and eye-sight remained for the few weeks during which they were kept track of, as before the operation. Since then he has noticed that his experience is not unusual. Poor results from trephining in buphthalmos have been noted by a number of men who have been well satisfied with the operation in chronic glaucoma.

Quackenboss speaks of having to abandon an attempt to trephine in buphthalmos on account of the extreme thinness of the sclera.

Axenfeld and Lundsgaard object to trephining in buphthalmos on entirely different grounds; the former because these patients being so frequently young, have so much longer and greater chance in the years of their life to have late infection; and the latter because the greater damage of traumatic injuries to the bleb which children are subject to.

If we grant that the results of trephining in buphthalmos are unusually poor, what explanation can be given of the fact? Those who believe in the inflammatory origin of buphthalmos may regard it as evidence of a tendency to plastic reaction by which the trephine hole is closed. It seems more probable to Gifford that on account of the excessive enlargement of the globe, the conjunctiva, especially at the limbus, must be applied abnormally tight to the globe, hence, when, after trephining, healing is complete, there must be

(6) Ophthal. Record, August, 1916.

unusual resistance to the formation of a bleb and an abnormal tendency for the conjunctiva to block the trephine hole. This suggests the probability that in buphthalmos it would be well, so far as the location of the trephine hole is concerned, to pursue a policy just opposite to that followed in normal cases. Since the attachment of the conjunctiva to the globe is looser at the posterior than at the anterior margin of the limbus, instead of putting the hole as far forward as the abnormally wide limbus will allow, one ought to put it as far back as possible and still keep the inner side of the hole within the chamber.

EYEBALL AND ORBIT.

The Spontaneous Explosion of Snellen Improved Artificial Eyes. The phenomenon of the spontaneous explosion of Snellen improved artificial eyes was definitely brought to the attention of A. S. Rochester[7] by a report from one of Casey Wood's patients, which told of having had two different eyes explode within a short space of time, each accident happening while the eye was being worn in the proper manner. In response to a *questionnaire* Rochester received twelve replies telling of eighteen occurrences of this nature.

All the cases present histories of a more or less similar type. The story as told by the patient is generally on the order of the following: While engaged in some normal occupation or pastime, he suddenly hears a report as if a pisol were shot off in close proximity to his head, at the same time he feels a sharp pain in the affected orbit and, on placing his hand to the part, finds the eyelids covered with blood. Quite naturally, he generally tells that he was greatly frightened and immediately consulted his oculist.

The replies from the physicians to whom these patients reported, show that none of the orbits sustained serious damage. In 88 per cent. of the cases there was some abrasion of the orbital lining membranes, varying

(7) Ophthal. Record, December, 1916.

from a slight cut which healed in several days, to deep lacerations which required two weeks in healing. From one to ten pieces of broken glass were found, in most of the cases, imbedded in the soft tissues and had to be extracted by the attending physician. Two of the patients lost consciousness, but this was in each case due entirely to fright and occurred in individuals of a hypersensitive nature.

Quite a number of the patients state that their first impression at the time of the accident was that they had been shot in the eye and even some of the bystanders have heard the report and seeing blood running from the orbit, have, for the moment, held the same opinion. Each explosion reported was absolutely spontaneous, there being no cause to which the individual could attribute it.

The receipt of this series of reports has shown that the spontaneous rupture of the Snellen improved eye, while being worn in the orbit, is not a remarkably rare accident. In fact, Rochester found through interviewing one of the large manufacturers of artificial eyes, that during the course of a year they will probably lose twenty-five eyes by spontaneous explosion, this occurring while the eyes are stored on shelves and from a stock numbering 25,000. This means that 0.1 per cent. of the improved eyes manufactured may be expected to explode, even though they be lying quietly packed away and not subjected to the many vicissitudes encountered by the eyes while in use.

In attempting to find the cause of these explosions, the method of manufacture was first studied and the manufacturers themselves interrogated. The makers state that in producing the Snellen improved type, it is absolutely necessary to seal the back of the eye while the whole ball is at a white heat. This naturally results in a partial vacuum of rather high degree in the interior of the globe, after cooling has taken place. There is, therefore, a continuous pressure being exerted on the outside of the finished eye. If there be a sudden change in the temperature of the globe, or a decided inequality in the temperature of different parts of the globe, the resulting sudden or unequal expansion or contraction

renders the glass less strong and therefore, less able to withstand the continuous atmospheric pressure.

It has been found that most of the explosions have happened during either very hot or very cold weather. In this series of cases at least one-half are said to have happened on exceptionally hot days.

The fact that the globe is built up of many different grades and colors of glass, and that in the finished state the walls are of many different thicknesses, makes the proper annealing of the whole a very difficult problem. This one problem of completely and successfully annealing the eye so that it will be absolutely impervious to all changes and conditions of temperature is something that has not yet been accomplished by the makers. They state that a great deal of study has been put on the subject during the past years and one large manufacturer states that as soon as the present rush of business, brought about by the great demand from the European battlefields, is past, they will again take up the problem.

The other deficiency of these eyes, and one which influences the possibility of explosion, is their susceptibility to the destructive effects of orbital discharges of certain patients. It has been found that certain individuals can wear an eye no longer than six months before discoloration and corrosion is seen to have begun. Others can wear the same kind of an eye for two years before any signs of deterioration are seen. The effect of the influence of certain person's secretions on the glass is shown in this series of cases. Out of eighteen explosions reported, four patients had experienced the accident two distinct times. In other words, out of all the cases reported to have had the improved eye explode while in the orbit, 28 per cent. had had a repetition of the phenomenon. When we consider the very small percentage of those wearing artificial eyes who have them explode in their sockets, and then realize that 28 per cent. of these who have had the accident occur, have had it occur twice, the conclusion drawn must be that the individual socket exerts a deleterious influence on the glass; the only plausible explanation of this being

that it is brought about through the chemical action of the secretions on the globe.

Novocaine Anesthesia in Exenteration and Enucleation of the Eyeball. H. Illig[8] reports seventy operations performed under this local anesthetic. He says that it is superfluous to add to the injections of the ciliary ganglion subconjunctival, parabulbar or intrabulbar injections; 0.3 per cent. novocaine is sufficient, in combination with potassium sulphate, *i. e.*, novocaine 0.0125, sulphate of potash 0.02, suprarenine (1:1,000) 2 drops, solution of sodium chloride (0.9:100) 5.00. Forty-five minutes before the operation a subcutaneous injection of scopolamine or morphine is made in very excitable persons; 15 minutes before a drop of a 5 per cent. solution of cocaine is instilled into the conjunctival sac, and 12 minutes before the operation 1.50 c.c. of the 0.3 per cent. solution of novocaine with sulphate of potash is injected from the temporal and nasal sides of the conjunctival sac behind the eyeball. There was no deleterious effect from the injections either before or after the operations.

Ligation of the Ophthalmic Vein for Exophthalmos. Frederick Krauss[9] very properly claims that a satisfactory method for the ligation of the ophthalmic vein for the relief of pulsating exophthalmos due to orbital aneurysm or varix, has not yet been described.

Good effects have been ascribed to the ligation and excision of some of the orbital veins through incisions in the eyelid. When it is remembered that the orbital fat is filled with enormously dilated veins with free anastomosis, the futility of such procedure is evident.

It occurred to Krauss that any deep-seated growth on the inner side of the orbit could readily be removed by separating the periosteum from the orbit from above, displacing the contents of the orbit enclosed within the periosteum. An incision in the periosteum at the desired point, would disclose the growth within the orbital fat, whence it could be removed or a large vessel might be tied, etc. The following operation was used by Krauss very satisfactorily upon a case of pulsating exophthal-

(8) Archiv. f. Augenheilk., p. 54, August, 1916.
(9) Ophthalmology, July, 1916.

mos, having a large pulsating vessel deep in the orbit, behind and to the inner side of the eyeball:

After the usual aseptic preparation of the field (the right eye in this case) the eyebrow being shaved, an incision was made down to the periosteum, beginning at the point of intersection of a vertical line extending from the outer canthus to the upper border of the eyebrow. The incision was carried parallel with, and 5 mm. above the upper border of the eyebrow to the root of the nose, curving along side of the nose to below the level of the caruncle. Owing to the enormous dilatation of the angular vein there was free bleeding which was caught with artery clamps. The periosteum was carefully separated until the optic nerve could readily be felt with the finger, also demonstrating a large pulsating mass nearby. A vertical slit was made in the periosteum showing the orbital fat to be completely filled with enormously distended veins. A pedicle needle armed with catgut was passed through the incision down, out and backward to enclose the largest mass of pulsating vessels at right angles to its long axis. The catgut was retained double and tied in two sections, making two ligatures with one insertion of the needle (Figs. 35 and 36). The pulsation ceased. The wound was closed with through and through silkworm gut sutures, including the periosteum.

In future cases, Krauss intends to apply other ligatures in order to enclose as much of the venous supply as possible to prevent free collateral circulation and a return of the trouble.

The vital points of interest in the case reported are as follows:

1. Apparent aneurysmal varix between the internal carotid and the cavernous sinus, evidenced by the intense exophthalmos of both eyes, worse in the right, palsy of the internal and external ocular muscles. Pulsation absent from eyeball. Very loud *bruit* heard all over the face and eye, but most intense over the temporo-frontal articulation. Continuous loud noise heard by patient, especially in the right ear.

2. Apparent cure of this condition by rest in bed. Moderate medication and intermittent compression of

Figs. 35 and 36. Ligation of the Ophthalmic Vein.

the common carotid. This was shown by gradual loss of the subjective noises, *bruit* no longer heard over the temporal bone, subsidence of the exophthalmos, complete in the left and largely in the right eye, with partial return of ocular movements.

3. A relapse causing more intense exophthalmos than ever in the right eye, moderately in the left. Intense chorioidal engorgement, retinal veins full, later chorioidal hemorrhages, vitreous hemorrhages, low grade of iritis with dilated pupil (palsy) absolute blindness. The blood-pressure continued high. Surgical consultants rejected tying of the common carotid as too dangerous in view of the condition of the patient.

4. Ligation of the ophthalmic vein by a new route—namely: Supra-orbital and retrobulbar—was successfully performed with partial cure of the condition.

5. Recurrence of collateral circulation in the dilated veins of the orbit caused a pulsation in a new area. The weak walls of the veins no longer retained by the dense periosteum gave way at times, allowing a free gush of blood through a small sinus in the upper inner angle of the orbit.

6. Frequent bleedings caused a fall of the blood-pressure to normal. The common carotid was tied without any further complications. Gradual subsidence of the exophthalmos followed. The patient's general health has been greatly benefited by her prolonged treatment and stay in the hospital. When she was discharged the condition was as follows: The right eye showed ectropion of the lower lid. The eyeball is in practically normal position with good muscle movement. The cornea is faintly nebulous below. The pupil is widely dilated and immobile. There is a fine haze of the vitreous, preventing a view of the fundus. The left eyeball is normal, except that the nerve shows slight atrophy.

7. The exophthalmos was found to be due to the enormous engorgement of veins in the orbital fat.

Krauss believes that tying of the ophthalmic vein is in itself insufficient in a severe type of aneurysm of the orbit, on account of the return of collateral circulation. If the angiomatous mass was tied off in various directions with heavy ligatures, a permanent success

would follow. One ligature is insufficient for a permanent cure.

8. The scar resulting from the operation is perceptible only upon close observation, being hidden above the eyebrow and on a line with the curve of the nose.

Six months after writing the above the patient operated on has made a complete recovery. Her general health is excellent and the scar resulting from the operation is scarcely perceptible.

Contusion Hypotony. E. Treacher Collins[9] believes that diminution of tension after contusion of the eye, apart from perforation of the globe, is not infrequent. In most cases, normal tension is restored in a few days; in others not for several weeks, and in some it remains so long as probably to be permanent. The causes he discusses under the following heads: (A) Diminished secretion, cases being divisible into (*a*) from nerve inhibition, (*b*) from vascular disturbance, (*c*) from epithelial damage. (B) Increased excretion, namely, (*a*) through normal channels, (*b*) through newly-formed channels. He submitted the following conclusions:

Hypotony following contusion of the eyeball may be due to different causes, more than one of which may be present at the same time.

When of short duration it is probably due to an increased rate of excretion of the intra-ocular fluid through the expanded normal channels of exit, or possibly, to some arrest of secretion, from paresis of the vasoconstrictor nerves.

When of long duration, it may be due to (*a*) the formation of new channels of exit for the intra-ocular fluid from the anterior chamber, from either an internal scleral rupture, or rupture of the pectinate ligament: (*b*) the cutting off of blood supply to the ciliary body from rupture of the anterior ciliary arteries, or (*c*) possibly the detachment of the pars ciliaris retinae.

If accompanied by extensive hemorrhage into the anterior chamber, either the canal of Schlemm has been opened up by an internal scleral puncture, or the anterior ciliary arteries have been torn across from cyclodialysis.

(9) Ophthal. Record, September, 1916.

If, when the blood has been cleared away, a portion of the iris has disappeared from view, as though an iridectomy had been done, then there has been cyclodialysis with rupture of the anterior ciliary arteries.

If, in the course of time, a translucent area appears just outside the sclerocorneal margin, like that seen in cystoid cicatrix, then there has been an incomplete internal rupture.

If the anterior chamber, without extensive hemorrhage into it, becomes markedly deepened in the whole or part of its circumference, there has probably been a rupture of the ligamentum pectinatum, limited to the pillars of the iris, and of the ciliary muscle, prolonging the angle of the anterior chamber outward.

If the lens is dislocated laterally and the retina detached, the vitreous humour has probably come forwards into the circumlental space, and may have dragged the pars ciliaris retinae away from the pigment epithelium.

A Movable Stump as a Substitute for Enucleation. The operation, advised and devised by Victor Ray,[1] is similar in its first steps to a globar evisceration. At first the conjunctiva is carefully dissected from the sclerocorneal border. With a Graefe knife, an incision is made similar to the cataract incision, except that it divides the cornea in halves, the point being introduced at the limbus and carried through to the opposite side, the incision being finished through the sclerocorneal border (Fig. 37). Then with a curved tenotomy or iris scissors the remaining half of the cornea is removed. The next step is carefully to dissect out the lens, iris and ciliary body; these structures must be completely removed. The chorioid, retina and vitreous are next thoroughly removed by the curette; there should be no pigment left behind. Careful wiping out with gauze is necessary and all hemorrhage should be stopped. The next step is to exsect completely the posterior pole of the globe from within the scleral sac. With a tenaculum the sclera is stabbed and slightly drawn up with a sharp tenotomy scissors, the sclera is incised and a circular piece, about 20 mm. in diameter, of the posterior

(1) Ophthal. Record, April, 1916.

pole is cut out which will include the point of entrance of the long and short ciliary nerves and the ciliary vessels together with the insertion of the optic nerve. The latter can be cut a quarter of an inch or more from its insertion. The next step is to introduce in the scleral ring thus formed, a piece of fat previously removed from the abdomen; this piece should be equal in size to the eyeball. The removal of fat should be done previous to the operation on the eye. The abdomen is prepared in the same manner as for a laparotomy, the skin being

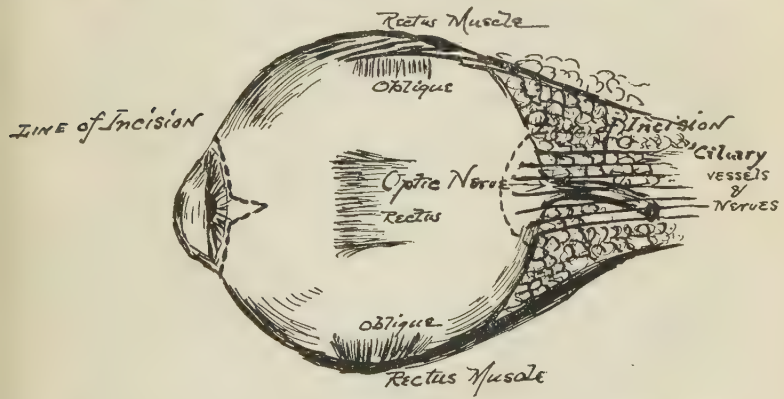

Fig. 37. Victor Ray's Substitute for Enucleation. Diagram Showing Lines of Incision.

shaved and sterilized with tincture of iodine and alcohol. The fat after dissection is put in a warm physiologic salt solution and kept until ready to be used. Sutures of black silk are then introduced through the conjunctiva and sclera, so as to close the scleral opening; three sutures are sufficient.

We thus have a stump which retains the natural insertions of the muscles, and is freely movable in all directions (Fig. 38). A certain amount of shrinkage and absorption may take place; this, only time will demonstrate. The patients so far operated upon have had no complication; a slight amount of edema of the tissues persisted for a few days, which, however, gives rise to no discomfort. This operation is in every respect dif-

ferent from anything that has been thus far suggested or has had a practical use.

The importance of retaining the contour of the socket, the objectionable sinking in of enucleated cavities, the resulting conspicuousness of artificial eyes, which the "reform," Snellen eye does not correct except in rare

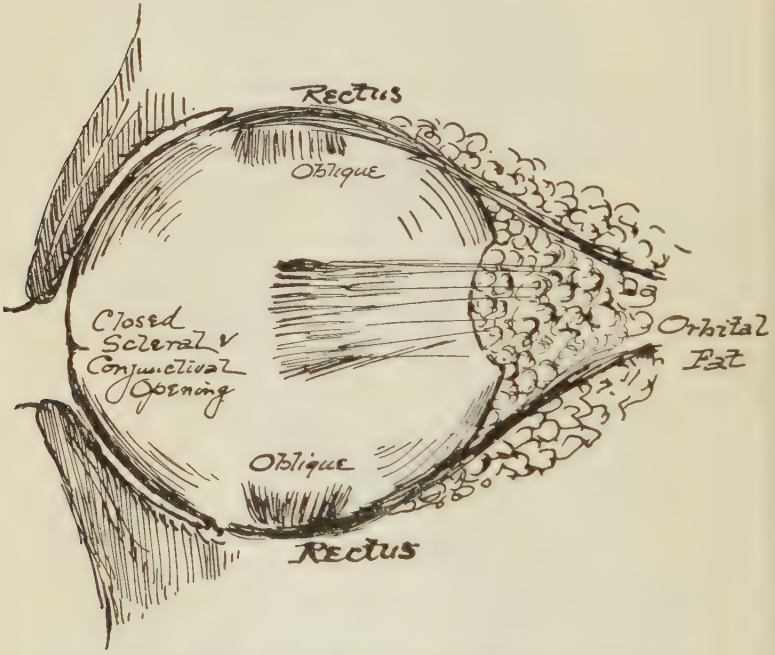

Fig. 38. Victor Ray's Substitute for Enucleation. The Stump.

cases, has made the unfortunate victim of this condition more or less a marked individual differing from his fellow men, influencing his career and frequently his earning capacity.

The main features of this operation are: (1) Retention of all the muscles of the ball, without disturbing their natural attachment; this includes the oblique muscles which also act upon the stump. (2) The removal of the posterior pole of the eye, severing all the nerves,

thus obtaining all the advantages of an enucleation. (3) The retention of the tough scleral ring thus formed which affords support to the enclosed fat (Fig. 39).

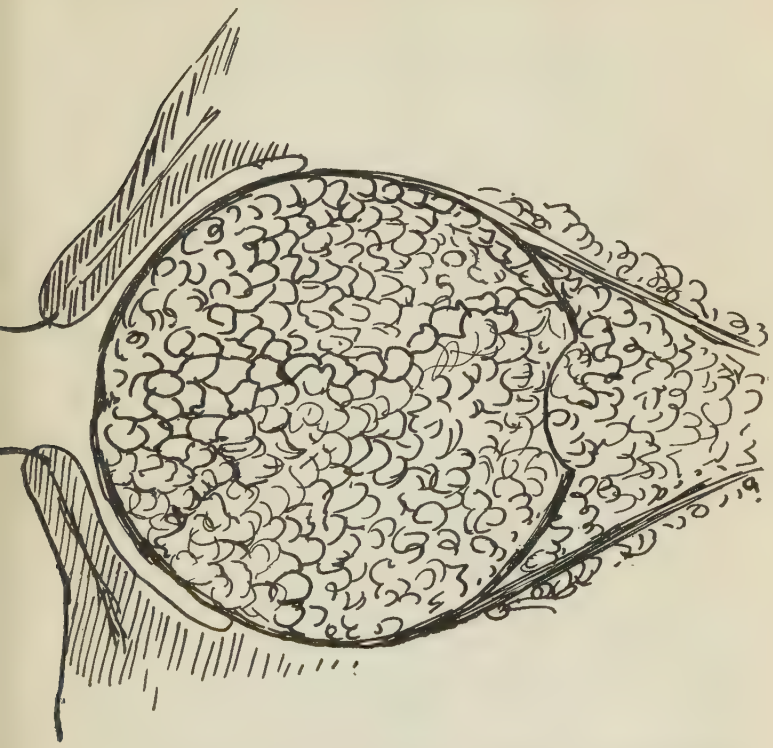

Fig. 39. Cross Section of the Orbit and Eyeball Showing Fat Which Is Continuous With the Orbital Fat.

Orbital Endothelioma. An interesting example of this neoplasm was originally reported in the *Ophthalmic Record* May, 1907, by C. A. Leenheer, who now completes the history.[2]

Mrs. F., aged 45, widow, has a negative family history. Has always been in good health. Over twenty-one years ago the patient noticed a turning out of the

(2) Ophthal. Record, May, 1916.

left eye, though the eyesight was good. The eye commenced to show protusion three years after the appearance of the strabismus, the patient entirely lost her eyesight in the affected eye. The patient was advised at that time to have the eye taken out but declined. Nothing was done in the way of treatment for the next three years. On September 26, 1904, vision, R. 20/20, L. blind. The left eye then protruded about three-fourths of an inch beyond the orbital margin, the lids covering and protecting the cornea nicely. The lids were swollen, patient states worse in the morning and there was loss of motion of all the muscles. The history sheet further records that "a divergent squint is present. The blood-vessels, both of the lids (conjunctival surface) and globe, are enlarged and engorged, especially the veins. The cornea is clear, the pupil slightly larger than the right, and in outline is round and regular. The media are clear. The examination of the fundus shows the disc elevated and best seen with a + 4 D. The outline of the papilla is indistinct. The tension is normal; on palpating toward the inner side of the upper and lower lids no distinct mass can be found. The structures are soft and the orbital cavity can be easily outlined." Kroenlein operation advised. The patient was operated upon the following day in Schroeder's clinic. An incision, slightly curved, was made, extending well up into the temporal region, down by the outer orbital wall, back in a horizontal direction toward the ear. The periosteum was detached up to the outer wall. The bone was separated with a chisel from within the orbital cavity, the soft structures, eye and tumor, being retracted with a spoon retractor. This wedge-shaped bone was left attached to the skin, making an osteoplastic flap. The muscle funnel was next entered and by blunt dissection the tumor removed piecemeal, which was found completely to fill the muscle funnel. After removal, all bleeding was checked, the wedge-shaped piece of bone replaced, the skin sutured and a dry dressing applied. Examination the following day showed severe reaction, ecchymosis extending across the bridge of the nose into the orbital tissue of the other eye, almost closing it, and extending into the scalp

down to the inferior maxillary bone on the operated side. The cornea was cloudy, conjunctiva chemotic, lids very much swollen. The globe had not at this time retracted. In a few days, under moist dressing, the swelling disappeared. Ecchymosis did not entirely disappear until four weeks later. The cornea cleared in the same length of time. The incision healed by primary intention.

However, the growth recurred and on November 9, 1910, it reached about the same size as when the patient first consulted Leenheer.

Since being operated upon the patient has given birth to three children, all living and well. The protruding eye has never caused any pain. On November 22, 1910, the patient was examined for evidence of metastasis. The report was negative. On October 21, 1915, an exenteration of the orbit was performed. The tumor mass was decidedly adherent, especially at and around the orbital foramen and the external orbital wall, where the Kroenlein bone flap had been made. The bleeding was checked somewhat by means of hot sponges. The periosteum was removed and the whole of the orbital cavity cauterized (Pacquelin cautery) and packed with gauze.

The secondary tumor has practically the same histologic structure as the primary neoplasm.

The conclusions to be drawn from this case are, (1), endotheliomata of the orbit are of slow growth; (2), orbital endotheliomata are painless; (3), they are prone to return at the site of operation; (4), the neighboring lymph nodes are not affected early.

GENERAL DISEASES AND OCULAR SYMPTOMS.

Dionin as an Ocular Test of Death. As A. Terson[3] points out, to distinguish real from apparent death and to prevent premature burial the eye has been much used, *viz.*, the corneal insensibility, the absence of winking, the dilatation and fixity of the pupils succeeding the myosis of the death agony, the glassy, glaring aspect, the loss of corneal polish, the hollowing and reduced

(3) Ann. d'Oculistique, March, 1916.

tension of the eye conduce to a strong presumption of death, in an apparently inanimate subject in whom the movements of the heart and the pulse are no longer perceptible. S. Icard has written on a method of extreme originality. He injects into the muscles, veins or subcutaneous tissue from 8 to 10 c.c. of a staining solution made up of fluorescein 10 grammes, carbonate of soda 15 grammes, distilled water 50 c.c. Only in the living subject is diffusion possible, and the appearances suggest a sudden icterus. The eyes, if we believe Icard, become like emeralds mounted in the orbits. The simple mechanical devices, such as hemostatic forceps on the mucosa, actual cauterization, arrest of circulation of finger by a band, arteriotomy, etc., deserve to be used, and in particular the irritating instillations.

D'Halluin has proposed to instil ether into the eye, but in a living subject ether may cause considerable necrosis and ulceration of the cornea, as in a case where during a long anesthesia ether has trickled down into an eye. The powder of dionin has not been known by Terson to produce any damage to the cornea, and he considers that a small pinch of dionin, placed in the lower cul-de-sac, constitutes an appropriate ophthalmoreaction, causing conjunctival and palpebral swelling, red tomato-like chemosis and smarting pain—a group of phenomena which almost constantly follow immediately the application of the powder.

Oxycephaly and Its Eye Symptoms. Most of the observations of this condition have been made by ophthalmic surgeons, since patients are brought to them on account of failing eyesight and nystagmus; frequently, however, the cranial deformity has been overlooked. Von Graefe reported the first case in 1866 in an 8-year-old child, who had typical choked discs. Since then about eighty cases have been reported. The cranial deformity is usually not considered important enough, according to W. Sharpe,[4] to warrant a professional opinion, unless there is impairment of the vision, and it has been observed that the greater the deformity, the greater the eye disturbance. A premature synostosis of the occipital, parietal and temporal bones has been ascribed

(4) Amer. Jour. Med. Sci., June, 1916.

as the probable cause of this condition. The union of these bones has allowed brain expansion only in the direction of the anterior part of the skull, producing either the high *turmschädel* type, or, in severe cases, the bulging prominence at the anterior fontanelle of the oxycephalic type; the resulting increase in the intracranial pressure producing choked disc and subsequent optic atrophy. In these cases the intelligence is not impaired. As possible mild types of "tower" skull, Patry cites, as examples, the skulls of Sir Walter Scott, Paracelus, William Humboldt, Mechel and others who had abnormally tall heads and who were exceptionally intelligent men. The three cardinal signs of the disease are (1) the cranial deformity, (2) exophthalmos with divergent strabismus, (3) impairment of vision. The author says that the exophthalmos is undoubtedly due to the very shallow orbit. The impairment of vision is always the result of secondary optic atrophy, and it is present in practically all of the cases. The writer advocates unilateral or bilateral subtemporal decompressions to relieve the pressure within the cranium and so avoid papilledema and secondary optic atrophy.

Headache of Ocular Origin. By far the most important extra-ocular symptom of eye disease and especially of *eye-strain* is *headache.* As a writer[5] in a recent journal reminds us, there is no single type of headache which is strictly characteristic of eye-strain, so that we have to base a diagnosis of ocular headache on circumstances other than the mere site of the pain, and often the diagnosis can only be settled by waiting for the results of optical treatment. An eye headache may occupy any position—frontal, temporal, vertical, parietal, or occipital—and it does not monopolize any of these situations; nevertheless, the fact that the vast majority of ocular headaches are frontal and a very large number occipital, suggests the eyes as the source of a headache if it occupies either of these positions. The suspicion is greatly strengthened, in the case of a frontal headache, if it is low in position and seems to be part of a pain centering in the eyes and extending into the orbit and head, and, whatever be the nature of the headache,

(5) Glasgow Med. Jour., November, 1916.

if it comes on during or after prolonged use of the eyes, especially at close work. This fact of association of the headache with the use of the eyes is seldom missed by the patient, even if it is a purely occipital headache, and the diagnosis is almost always confirmed by the discovery of some defect leading to accommodative or oculomotor strain.

When the patient's mode of life is regular, an ocular headache will usually have a regular periodicity. For example, a machinist, a draughtsman, or a bookkeeper will be free from headache in the morning, but it will come on and increase as the day advances, or it may make its appearance regularly every evening after the day's work is done. In some cases—teachers, for example—the headache is persistent throughout the week, but the patient gets relief at the week-end from cessation of the usual occupation; while others, who use the eyes but slightly during the week and indulge in an orgy of reading on Sunday, may have a purely week-end headache. Thus, a knowledge of the patient's habits will help in correctly interpreting the symptom.

While it is chiefly work at close range, such as reading and sewing, which excites ocular headaches, there are many other circumstances which bring about the same result. Among these are shopping, traveling by car or train, and visits to picture galleries, theatres, and cinemas. The cinema headache has assumed quite an important place among eye symptoms within recent years. One frequently hears the remark that our eyes must be deteriorating, since so many of us nowadays have to wear glasses. Our experience of cinema headaches is one illustration of the fallacy of this argument. Many who were blissfully ignorant of any ocular defect, having neither dimness of vision, asthenopia, nor headache, have been driven to the use of glasses since the "movies" habit revealed the existence of a slight astigmatism or other source of headache.

Fortunately in most instances of ocular headache the association of the symptom with use of the eyes is apparent, and a fairly confident diagnosis can be made; but there are many cases in which the connection cannot be easily traced, and in which, nevertheless, relief is to be

PLATE VI.

Mikulicz' disease. Enlarged lachrymal glands, side view.—Posey (see page 122).

Mikulicz' disease. Enlarged lachrymal glands, front view. (Posey.)

obtained by glasses. The headache may be constant, and not apparently aggravated by use of the eyes, or it may be present on waking in the morning and disappear in the course of the day. Sometimes it seems to vary in situation. No doubt in many of such cases there are several contributing causes for the headache, but it is not difficult to believe that eyestrain may be the last in a series of stimuli, the summation of which gives rise to the pain. If it is even only one factor in the case, its relief will diminish, and may even remove, the headache.

In the investigation of a case of supposed ocular headache it is not sufficient to look for an error of refraction, for in a certain proportion of the cases the cause lies rather in a lack of balance in the action of the extrinsic eye muscles, with a tendency to lateral or vertical deviation of the eyes—heterophoria, or latent squint. The headache in these circumstances may be quite indistinguishable from that due to errors of refraction, but sometimes there are features which give a hint of the source of the trouble. One of these is the patient's discovery that the headache disappears on covering one eye; another is the fact that steady vision is rendered impossible by an annoying tendency to double vision. The former, which is chiefly experienced in reading, results from the fact that binocular single vision is only maintained at the expense of muscular fatigue; while the tendency to diplopia, which is usually experienced in contemplating distant objects—for example, the preacher in church—depends on the fact that when accommodation is relaxed the abnormal muscle effort required to maintain binocular vision is also relaxed, and the latent deviation becomes manifest.

It has been remarked that a frontal, and especially a low frontal, headache is very suggestive of an ocular cause. There is one well-marked exception to this. One is occasionally consulted by patients suffering from a low frontal headache, on the supposition that it is an ocular one, when, in fact, the seat of the trouble is in the frontal sinus. When the matter is looked into, it is found that the pain is situated in the upper inner part of the orbit, often on one side only, there is some-

times tenderness on pressure on that part of the orbital roof, and the headache has a characteristic periodicity, being present in the morning, increasing in intensity for some hours, say till mid-day or the early afternoon, and then quite rapidly or suddenly passing off, perhaps with a slight flow of mucous discharge in the corresponding nostril.

Mikulicz's Disease. A case of *symmetrical lymphomata of the salivary and lachrymal glands,* or Mikulicz's disease, is reported by W. C. Posey.[6]

A colored woman, aged 21, married, came with the history of swelling of the upper lids four weeks before, which became hard two weeks later. These masses caused no pain, though the lids smarted at night.

She was a thin, rather poorly nourished negress of very dark skin. There was no evidence of eruption, but a dry infiltrated condition of the skin around the knees and extensor surfaces of the thighs and legs. Mucous membranes were pale. The septum of the nose was deflected with hypertrophied turbinates. Five or six teeth were in process of decay, with gingivitis surrounding the lower molars. Enlarged sublingual glands were palpated through the mouth. Thyroid was considerably enlarged, right lobe more so than left.

"Long narrow chest with infra- and supra-clavicular depression right side. Chest-wall thin and emaciated. Heart, negative. Lungs, dullness on percussion over right upper and lower lobes and left lower lobes. Tactile and vocal fremitus increased. Tubo-vesicular and strains of tubular breathing with subcrepitant râles heard. Abdomen negative. Submaxillary, axillary, inguinal and femoral glands enlarged and palpable. Knee-jerk absent right side, slight response on left side. No Babinski. No ankle clonus. Von Pirquet, positive. Wassermann, positive, plus 4. Blood, W. B. C., 6,800. R. B. C., 4,650,000. Hemoglobin, 77 per cent. Urine, sp. gr. 1034. Albumin, negative. Sugar, negative."

The palpebral openings were somewhat elliptical in shape. At the upper and outer angles of orbits and merging with the tissues of the upper lid were swellings as large as a hickory-nut. Movements of the upper lids,

(6) Ophthal. Record, June, 1916.

especially outer half of same, were limited. The masses were hard, laminated and lobular and somewhat cartilaginous on palpation. Tumor masses corresponded to site of lachrymal glands. On deep pressure it was found that they extended under the superior surface of the horizontal plate of the frontal bone, but were not continuous with the osseous tissue of the orbit or with the cartilages of the lid. Had slight motility, backward. Overlying tissues freely movable. Tumor masses not especially tender. Superficial veins of upper lid moderately dilated. Slight limitation of upward rotation in each eye-ball; other movements unrestricted. Palpebral conjunctiva moderately injected. Eyeballs otherwise normal (Plate VI). With the correction of compound hypermetropic astigmatism, vision was normal in each eye. Temperature sub-normal.

The symmetrical involvement of both lachrymal glands, in association with enlargement of other portions of the glandular system, warranted the diagnosis. It is true that the parotids have escaped, but they may be affected later, if the treatment, as so frequently happens, proves ineffective. Like all the other cases reported in this country, the patient is colored, and the eyes with the drooping curve at their outer angles, resemble, as Ziegler has pointed out, the eyes of a blood-hound.

Neither the tonsils nor turbinates in this case appeared to be sufficiently enlarged to require treatment.

In another case studied by the writer 15 years ago, in a tuberculous young colored girl, both lachrymal glands were symmetrically involved, but there was no apparent involvement of the glandular system elsewhere in the body. The hypertrophy of the glands resisted all treatment, but finally disappeared entirely without treatment after a persistence of more than a year.

An interesting phase in the course of the disease is the retrogression of the glandular swellings during the course of an acute intercurrent disease and their recrudescence in some cases after convalescence. Ziegler cites such occurrence in the practice of Kümmel during pneumonia, Mikulicz during appendicitis, Haeckel through a severe enteritis, etc., and suggests that such retrogressions are brought about by the general disease creat-

ing a systemic polymorphonuclear leukocytosis, which temporarily overwhelms and obliterates the localized hyperleukocytosis in the affected glands.

Tabetic Ocular Crises. Ocular crises were first described, as W. G. Spiller[7] reminds us, by P. K. Pel (1898), but have not been generally recognized, and only a few cases are recorded. Oppenheim, even in the sixth edition of his text-book, states that ocular crises with attacks of severe pain in the eyes, secretion of tears, spasm of the orbicular muscles, and hyperesthesia of the eyes and parts about the eyes, are not to be accepted as tabetic until further experience has been obtained. It is desirable, therefore, that cases of this character should be made known. Oppenheim has observed hyperesthesia of the retina in tabes which interfered greatly with a testing of the light reflex, as the eyes filled with tears on every attempt to take the light reflex.

Pel's case was one of tabes with paroxysms affecting both eyes, of ocular phenomena consisting of irritation of sensory, secretory, motor and vasomotor nerves. The mental condition of his patient during the attacks was altered. The man was restless and irritable. The ocular attacks occurred with sudden severe burning and stabbing pain in both eyes, interrupted by short intermissions. Pronounced secretion of tears with photophobia soon followed the pain, and it was difficult for the man to see because of spasm of each orbicularis palpebrarum muscle. The attacks varied in their duration. Sight was not affected in the intervals. In one attack the conjunctiva of each eye was red and swollen, and the eyes and area about the eyes were hyperesthetic, so that examination of the eyes was impossible, and the man felt exhausted after the attack. The appearance of the eyes during an attack was like the condition produced by rubbing the eyes in the presence of a foreign body beneath the lids. There is no mention of visual phenomena, and the optic nerves were normal. The condition was one of irritation of the trigeminal nerves, and the ocular pain was regarded as ciliary neuralgia. There was persisting paresthesia in the distribution of the trigeminal nerves.

(7) Jour. Amer. Med. Ass'n., Mar. 18, 1916.

Pel stated that until the time of his report no case of crises of one of the upper cranial nerves had been observed, as crises had been seen only in organs rich in vagus and sympathetic fibers. As the trigeminal nerve contains secretory, sensory, motor and vasomotor fibers, crises of this nerve might be expected, and this nerve is often affected in tabes.

Pel refers to reported cases of tabes with irritation of secretory fibers of the trigeminal nerves, as secretion of tears *(crises lacrymales, dacryorrhée ataxique)*, violent sneezing *(crises nasales)* with paresthesia of the nose, and finally increased secretion of saliva (Patrolacci, Féré, Koenig, Klippel). Klippel observed disturbance of taste in tabes. Pel speaks of ophthalmia neuroparalytica and tabetic ulcer of the mouth, trophic disturbances of the trigeminus, occurring rarely in tabes.

Pel's case differed from the examples he quotes in that it presented a combination of symptoms with pain predominating and occurring in sudden attacks, and therefore like tabetic crises. The hyperesthesia of the eyes and parts about the eyes during and following the attacks was important, and the spasm of the lids was regarded merely as a reflex act.

The case of ocular crises in tabes reported by Haskovec was not exactly like Pel's case. A man, aged 37, had frequent attacks of pain, secretion of tears, and left exophthalmos. The left exophthalmos after an attack of pain became so great that the eyeball almost came out of the orbit. The secretion of tears was intense. The description makes the location of the pain uncertain, but it appears to have been in the eyes. No visual phenomena are mentioned.

Knauer's patient, a woman with tabes, frequently had pain in the forehead with tenderness to pressure over the upper division of both trigeminal nerves during the pain. She had also pain in the right eye and adjoining region, with swelling and redness of the conjunctiva, free secretion of tears, photophobia, and contraction of the pupils. Only the right eye was affected in the first attack, but in later attacks the left eye became affected, as shown by redness and swelling, hyperesthesia, photo-

phobia, sensation of a foreign body in the eye, and lachrymation. The most striking peculiarity of this case was that in one attack the right eye was affected and in another attack the left eye. Taste and smell were lost during the attack when there was hyperesthesia of the mucous membranes of the nose and throat; there was disturbance, therefore, in nerve supplies other than that of the trigeminus, but here there was loss of function, and not increase of function in another nerve territory as in my case. Knauer explains the loss in his case as a result of the hyperesthesia of the mucous membranes.

Ocular Tuberculosis. An account of some of the *tuberculous diseases of the eye* is given by R. B. Metz.[8] In all ten cases of suspected ocular tuberculosis were investigated. The writer says of them that they comprised:

1. Scleritis, sclerosing keratitis and sclerochorioiditis, and tuberculosis was definitely present in eight instances. This was shown by a reaction following tuberculin inoculations in five, all the patients who were inoculated reacting; in three there were signs of pulmonary tuberculosis; in one case signs of an old pulmonary process, and in one case the examination could not be completed. All four cases of chorioiditis reacted to tuberculin injections.

2. Each of the ten cases, four of scleritis, two of sclerochorioiditis, and four of chorioiditis, in which the blood Wassermann test was performed, reacted negatively, while the nine of these patients inoculated with diagnostic doses of tuberculin reacted positively. In one patient not inoculated, the physical signs of pulmonary tuberculosis were prominent.

3. The seven cases in which a general reaction followed the diagnostic use of tuberculin, showed negative physical findings. The eighth patient has yet to be radiographed.

4. Of the nine reactions to tuberculin, eight were general without an ocular focal reaction, while one was an ocular focal reaction without a general reaction.

5. All six of the cases in which the positive von Pir-

(8) Cleveland Med. Jour., September, 1916.

quet reaction was followed by a diagnostic inoculation of tuberculin, reacted positively to the latter.

6. Tuberculin therapy in the five cases in which it was employed, accomplished the apparent cure or marked improvement not attending the use of the routine measures.

Tubercle of the Chorioid in the Diagnosis of General Tuberculosis. There is in modern times, thinks Sydney Stephenson,[8] a tendency to overlook the general diagnostic value of tubercle of the chorioid. As regards affections of the meninges, the importance now attached to a naked-eye, chemical, microscopic, and bacteriologic examination of the cerebrospinal fluid is doubtless partly responsible for this neglect. How simple is the diagnosis, say, of a tuberculous meningitis rendered when, in association with meningeal symptoms, the cerebrospinal fluid is found to have lost its normal limpidity, to contain lymphocytes, and to include tubercle bacilli. At the same time it is well to remember that the discovery of tubercle of the chorioid may enable us to diagnose not only diseases of the central nervous system but the tuberculous nature of lesions of other parts of the body. In one condition, indeed, acute tuberculosis, it is the sole pathognomonic sign.

Dysmetropsia. Cases of this peculiar condition (a defect in the capacity to appreciate the size and distance of objects) are divided by S. A. K. Wilson[9] into (*a*) those in which the lesion was presumably peripheral, (*b*) those in which it was probably central, (*c*) psychical cases. In a case of the latter the young woman, who was the subject of hysteria, always saw the right half of objects much larger than the left; and if two shillings were placed side by side, she considered that the one on the right-hand side was a half-crown. In a case of occipitoparietal tumor, the objects seemed so near that they appeared to be practically touching the observer's face. Wilson considered that in judging of distances and sizes of objects we learn more from the retina than from so-called kinesthetic impressions.

(8) Lancet, Sept. 9, 1916.
(9) Med. Press, May 17, 1916.

INJURIES OF THE EYE.

Injury to Eye from Explosion of Golf Ball. One might expect, after the widespread warnings against golf balls of certain kinds, that accidents from their irregular use would be avoided. Yet we continue to hear of such injuries. E. J. Bernstein[1] relates an instance in which a child of 12 suffered a severe burn of the right eye, caused the night before by the bursting of the core of a golf ball which had been used as a toy. There was great edema of the whole conjunctiva, completely enveloping the cornea, and the lids were greatly swollen. The eye had been very well washed by Dr. Hawkey of Bloomingdale. Bernstein cleaned it with a mild acid solution (1:2,000 hydrochloric acid) and put in 5 per cent. ethylmorphin hydrochloride (dionin) ointment with 2 per cent. atropine. Except for hot compresses of boric-acid solution, this was the entire treatment. The eye has gone on to recovery with no symblepharon and only a slight central leukoma when the patient was last seen.

The idea of using mild acid solutions is indicated from the analysis of the contents of this particular kind of ball, as given by L. W. Crigler in the *Ophthalmic Record*, October, 1913, *viz.:* a mixture of barium sulphate, sodium hydroxide and common soap. This should be borne in mind, as it is commonly supposed that the mixture is an acid one.

This is the second case which has come under Bernstein's care in two years. In conversation with other physicians, he learned of similar cases, none of which were reported, as the men had an idea that they were altogether of too common occurrence to be noteworthy.

Blindness from Occipital Injury. In the case of a four-year-old, a child blind after injury to the back of the head, Leo Newmark[2] furnishes a report of the eye findings four years after the accident, *i. e.,* when the patient was 8 years of age. At the time of a preliminary report he seemed to have been blind about six months. At the time of this *first* report he could see: "how much, it has not yet been possible to determine

(1) Jour. Amer. Med. Ass'n., April 22, 1916.
(2) Cal. State Jour. Med., December, 1916.

accurately, for he can not be induced to fix his gaze with sufficient steadiness to make a perimetric register possible." His central vision was evidently good, but it was thought that the field was greatly constricted.

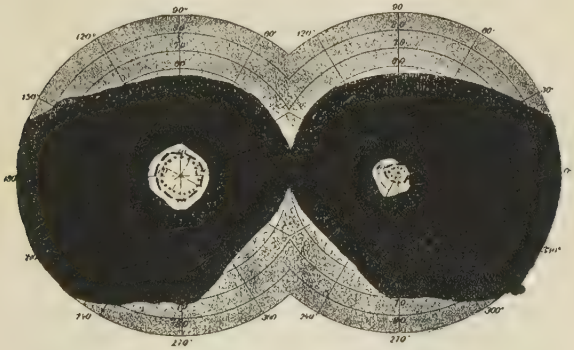

Fig. 40. Blindness from Occipital Injury Four Years After the Accident.

Since then the boy has grown in understanding, and Dr. W. S. Franklin was able to map out the fields; the diagrams show them for white, blue and red, in the order mentioned. The optic discs look just as they did in 1914: they are pale, the right paler than the left, but the vessels are not narrow. Central vision is 20/30 in the right eye, 20/20 in the left (Fig. 40).

Transplantation of Cilia into the Anterior Chamber. The chief facts of this accident are furnished by H. L. Begle.[3] He remarks that in perforating injuries of the eyeball, eyelashes may be cut or torn from the lid margin by the perforating object and carried with it into the eye. Also in operations in which the eyeball is opened, cilia may be cut by the instrument in the hand of the operator and introduced into the anterior chamber. While the transplantation of cilia is not infrequent in injuries, it is an exceedingly rare occurrence during operations. When operating, nevertheless, we should bear in mind the possibility of this accident happening, for a number of authentic cases are on record.

(3) Mich. State Med. Soc. Jour., November, 1916.

Cilia are transplanted into the anterior chamber of the eye most often in those types of perforating injuries where the penetrating instrument does not remain in the eye. Occasionally a fragment of steel or copper may carry with it cilia into the vitreous or the metallic fragment may enter the vitreous while the cilia is left behind in the anterior chamber. The cilia may be free and movable in the anterior chamber; more often it is fixed either through contact with iris, pupil or angle of chamber, or through being embedded in exudate, blood, or opaque lens matter. Often one end of the cilia remains fixed in the corneal wound.

The presence of cilia in the anterior chamber may be quite easily overlooked. Focal illumination and a monocular or binocular loupe are of assistance in their detection.

Inasmuch as cilia, because of their position and function, catch innumerable dust particles and dirt, it might be supposed that when carried into the anterior chamber, they would frequently be a source of infection and set up severe purulent or plastic inflammation. The contrary, however, appears to be true, cilia in the anterior chamber being borne by the eye generally for considerable periods without marked reaction or serious results. In explanation of this phenomenon attention may be called to the fact that the rapid filtration of aqueous from the anterior chamber allows little opportunity there for bacterial growth. Moreover, cultural attempts by Müller showed, rather surprisingly, that cilia are not very often harborers of pathogenic microörganisms. Even when infection does occur in perforating wounds where cilia have been implanted, the infection may have been brought about by the perforating object rather than by the cilia.

If the cilia is a carrier of pathogenic microörganisms it can undoubtedly set up purulent or plastic inflammation. Two cases reported by Hirschberg point with certainty to cilia as a source of such infections, for in both instances a circumscribed purulent inflammation cleared up after the removal of the implanted cilia.

While cilia, as stated, may remain in the eye for many years without giving rise to any disturbing symptoms,

in many cases they have caused sooner or later complications, such as recurrent irritation, mild plastic inflammation, and epithelial tumors or cysts. Mechanically, cilia may give rise to irritation especially if a point is in contact with iris or cornea. Partial expulsion of cilia from the anterior chamber has been reported. This appears to be largely due to the long continued irritant action of the cilia at the point of contact with the cornea. Iris hyperemia and mild plastic inflammation may occur at repeated intervals from the scratching and pricking to which the iris is subjected during normal movements of contraction and dilatation. Exudate may be thrown around the eyelash at such times. When plastic inflammation occurs in perforating wounds, where in addition to the presence of implanted cilia there is traumatic cataract, anterior synechia or wounds of the iris, the cilia may be only one of the responsible factors in the inflammation.

MILITARY SURGERY OF THE EYE.

While this volume is under preparation the operations of warfare are definitely brought to our own shores. It is of considerable importance, therefore, that as large a space as possible be given in this *Series* to the above subject, even to the exclusion of other matter.

As is well known, the literature of military surgery is becoming much more voluminous than that of any other subject; but only an incomplete survey of its relations to the eye can be here provided. Probably the best review of the subject for the past year is the section on *Military Surgery of the Eye,* written for the recently issued tenth volume of Wood's *American Encyclopedia of Ophthalmology* and contributed by Lloyd Mills, of Los Angeles. A few extracts from that admirable essay are here given, but a perusal of the original is needed to complete the study of this subject.

Mills first draws our attention to *the character of the ocular damages inflicted by modern projectiles and other weapons of offense.* It frequently happens, he says, that the missile which has damaged the eye produces

other lesions of gravity in its direct or deflected course, tears off the lower face, opens the anterior cranial fossa, traverses the larynx, fractures the cervical spine or enters the thorax, and it is the rule in these cases that the grosser clinical damage dominates the scene and that the ocular injury receives little or no attention from the general surgeon, but is seen by the ophthalmologist weeks or months after the injury, when its condition has become irremediable, or an active source of danger to the other eye. Elschnig goes so far as to suggest that the authorities of the hospitals through which these neglected cases have passed may be held responsible for damages for blindness, where the requisite minor treatment has been omitted. Naturally, the less imperative measures, such as the routine radiographic examination, the more complicated cases of intraocular foreign bodies and extensive plastic operations on the orbit and lids are preferably done in the reserve or civil hospitals, but provision for the adequate first aid treatment for these and for all eye wounds soon after injury and while *en route* to the rear is a matter of such consequence in preserving vision and in preventing infection, that a knowledge of its essentials should be spread among civilian surgeons suddenly called to active military duty, and among professional military surgeons as well, by means of special instructions. A summary of such instructions follows:

First Aid in Battle Wounds of the Eyes. (1) Before cleansing or manipulating a recently injured, sensitive eye, lightly anesthetize it with from 2 to 3 drops of 4 per cent. solution of cocaine, instilled at three-minute intervals. (2) Cleanse the skin of the lids and the adjacent field by gently washing with soap and water, followed by benzene (benzol). (3) Cleanse the conjunctival sac of loose foreign material by free irrigation with warm 3 per cent. solution of boric acid, warm normal saline or warm 1-10,000 bichloride or oxycyanate of mercury, whichever may be available, not forgetting that strong antiseptics may seriously damage the cornea. (4) Where foreign bodies are deeply imbedded in the cornea and where the whole cornea and conjunctiva is tattooed with indriven mud, fragments of stone and

metal, the dangers of corneal perforation and infection are so great that such cases should be hurried to the nearest specialist center. (5) A wound of the eyeball, the gray-white change of a traumatic cataract and occult blood in the anterior chamber, usually mean perforation of the eye by a foreign body. These cases demand the earliest possible specialized care and should be given precedence of way to the rear. The chances of infection of the globe through the open wound are so greatly lessened by promptly covering the wound with a flap of conjunctiva that more eyes can be saved and more practical vision retained in such eyes by this than by any other single procedure. With corneal wounds a sufficient amount of adjacent conjunctiva is undermined and drawn down and held in place over the opening by simple conjunctival sutures of fine silk at each angle. If the laceration is considerable, but there are possibilities that some vision may be retained, the entire cornea may be thus covered and protected by undermining the conjunctiva throughout the whole circumference of the cornea and uniting it over the front of the cornea. (6) Both eyes should be put at rest by full dilation of the pupils with 1 per cent atropine, a matter of much importance during rough transportation, and, unless contraindicated, both eyes should be lightly bandaged, using gauze, cotton and bandage material from within outward. In a few cases the tension of the eye, determined by palpating the globe between the index fingers, is high, and in this condition instillations of a 1 per cent. solution of eserine are indicated, instead of atropine, until the pupil is very small. (7) Eyes which are suppurating from any cause should not be bandaged but are to be washed out freely and frequently. Extension of the infection to the sound eye and to the eyes of others is to be guarded against. (8) Unless an eye is completely shattered, too early enucleation is not to be counseled. Sympathetic inflammation of the sound eye is almost unknown inside of two weeks after injury, and many eyes are blinded for the time being by intraocular hemorrhage which can clear in a few weeks or months and leave more or less useful vision. The decision in this matter of much importance is best made at

the specialist center. (9) Inflamed and tender eyes with failing vision or without vision are best enucleated at once, because of the danger of sympathetic inflammation of the sound eye. The conjunctiva and the ocular muscles are spared as much as possible in order to form the best possible socket for an artificial eye. (10) Eyes which have been shattered are to be enucleated at once, with particular care to remove all fragments of the globe which are so commonly driven deeper into the orbital fat. By early operation, excessive cicatricial contraction is avoided and a far better bed formed for an artificial eye. (11) Fragments of missiles lodged in the orbital tissues are harmless if producing no evidence of irritation. (12) Defects in the lids should be repaired at once, lest cicatricial contraction make a good result difficult or impossible to obtain. (13) Wounds of the eyes and orbit are no exceptions to the routine employment of antitetanus serum in military wounds. (14) The routine use of narcotics in injuries of the eyes is to be deplored, in view of the possibility of habituation. Small doses of paregoric or tincture of opium are usually sufficient. (15) The inclusion in the medical equipment of a focusing lens, a self-retaining lid retractor, an instrument for removing foreign bodies from the cornea and of atropine, eserine and cocaine in the form of salts or solutions is essential for the adequate care of battle injuries of the eyes.

Because of the deep position and bony investment of the eyes, projectile wounds thereof are frequently complicated by grave damage to adjacent tissues, often of such a nature that even serious ocular injury becomes of secondary importance. The orbital buttresses, of such protection to the eyes in civil accidents, become a positive menace in military life because of their tendency to extensive comminution and secondary missile effect. The lids, the walls of the orbits, the nose, of any and all of the accessory sinuses and of the anterior and middle cranial fossas may be crushed, splintered or wholly torn away, putting the orbits into wide communication with meninges, nose and mouth and producing horrible mutilations. Complicated injuries of this sort not infrequently fall to the care of eye surgeons,

especially during and after the colossal battles of the present day, where no medical organization can be elastic enough to handle the crowding transports of wounded and where all departments of the service being strained to their utmost, the lines of cleavage between the specialties are lost.

The general care of battle wounds of the eyes and the optic apparatus presupposes some knowledge of the conditions of employment of shrapnel, shells and bullets, of the mechanism of their action, of their characteristic effects upon living tissues of the head, and of the general principles of treatment of military wounds.

1. *Shrapnel,* which is responsible for about three-fourths of all artillery wounds in mobile warfare, consists of cylindro-conoidal casings of cupro-steel weighing from 15 to 20 pounds, containing from 300 to 500 round lead bullets, usually hardened with antimony, from 1 to 1.5 cm. in diameter and weighing from 10 to 16 grams each. These are imbedded in a smoke-producing matrix, usually some variety of sulphur, which indicates the point of explosion to the artillery observer. The base of the cylinder contains a bursting charge of some high explosive, usually of terrific detonating power, which is timed, by a fuse in the detachable head, to explode at any given point in the projectile's flight, or upon impact. The characteristic feature of shrapnel which determines its main use and makes it most effective against bodies of troops in the open, is the forward-reaching and rather flat trajectory of the charge after bursting, the bullets being propelled forwards and downwards in a cone-shaped stream whose velocity depends upon the velocity of the shell rather than upon the power of the bursting charge. The effective area of dispersal of shrapnel fragments is, accordingly, much greater than that of the fragments of a high explosive shell of the same caliber, but with its characteristic downward trajectory after bursting. At 3,500 yards, the usual shrapnel range, the bullets of an 18-pound shrapnel cover an area of about 7,500 square yards, while the splinters of the 18-pound field gun high explosive shell are effective over an area of about 500 square yards, but within that smaller space the latter shell

destroys everything and its power for destruction increases in proportion to the cube of the diameter of the shell, a 12-inch, for example, being eight times more deadly than a 6-inch. More than 70 per cent. of the ammunition used by field guns in modern battles is in the form of shrapnel and anti-aircraft guns are exclusively of this type (Fig. 41).

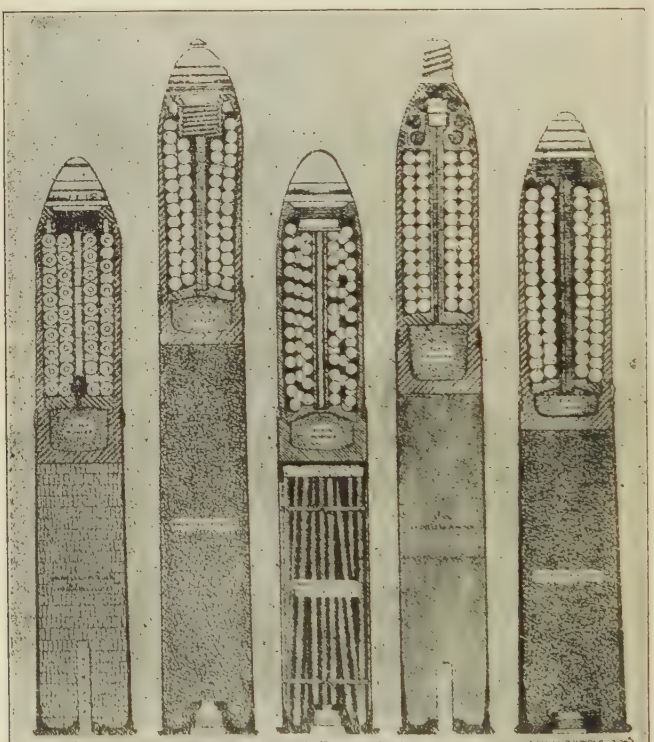

Fig. 41. Type of shrapnel in modern use.

Each shrapnel bursts into from 2,000 to 3,000 fragments, varying in size from large irregular pieces of casing possessing all the terrible lacerating effect of solid shot, to jagged lumps of metal, fine, sharp slivers and

tiny, dust-like particles whose presence in tissues like the eye is often demonstrable only after repeated radiograms, or is told only by the intra-ocular damage they have produced. This large number of fragments and the infinitely larger number of secondary missiles, such

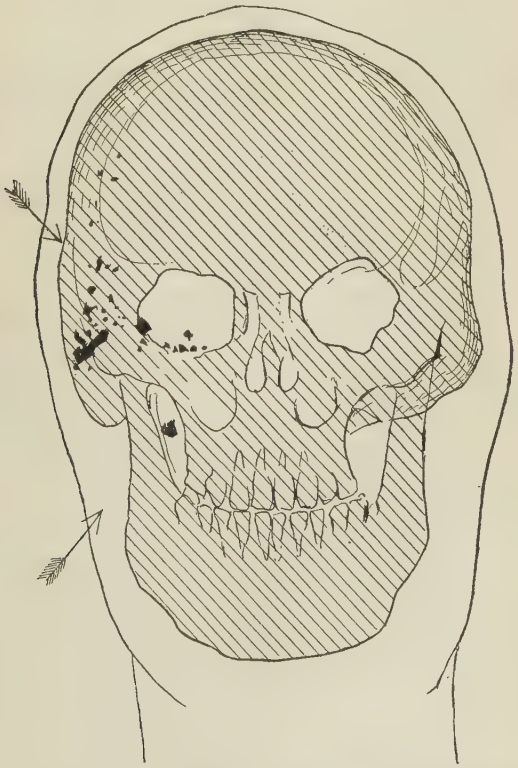

Fig. 42. Radiographic tracings of shrapnel fragments in side of face.

as earth, mud, stones, wood and metal, set in motion by the explosion of shrapnel, in common with all manner of shells, explains the frequency of shrapnel injuries to the eyes, of multiple perforations and of the lodgment of numerous metal splinters and secondary missiles in

the orbital fat, the lids and the adjacent face. Shrapnel wounds of the eyes occur about a third more often than bullet wounds, but owing to the grosser and more intense trauma of the latter missiles, the eyeball is saved far more frequently after shrapnel injury (Fig. 42).

The *effect of shrapnel bullets* is comparable to that of the old-fashioned rifle bullet in that the power of penetration is comparatively slight. They cause local depressed fracture of the skull without laceration of the dura much more often than they perforate the dura and lodge in the brain, and the passage of a shrapnel bullet through both orbits, an occurrence of no rarity with modern rifle bullets, is almost unknown. The characteristic tendency of a shrapnel ball is to break one bone and to lodge immediately. Octave Laurent reports primary infection in 40 per cent. of general shrapnel wounds occurring in comparatively mobile warfare. Lloyd Mills states that 85 per cent. of the total shrapnel wounds of mixed trench and mobile warfare seen during his service in Austria were infected, while others, like Sir Almroth Wright, report infection of practically all shrapnel and shell wounds in trench warfare. Disregarding its exact percentage, it is certain that infection is the most serious element of these wounds and that orbital cellulitis of all degrees, panophthalmitis, meningitis and erysipeloid inflammations of the lids, face and scalp are common, distressing and not infrequently fatal sequels of perforation and laceration of the eyes and adjacent regions by shrapnel and the smaller shell fragments. The literal covering of entrenched soldiers with mud, largely manurial in origin, is mainly responsible for this excessive infection in trench warfare.

2. *Shells,* among which are included bombs, grenades of all kinds and, from their similarity in effect, mines, range from sizes scarcely larger than shrapnel to great cylindro-cones of steel as tall as a man and weighing over a ton. The cavities of these iron or steel casings enclose a violent explosive charge which, in the case of bombs and grenades, is often partly replaced by irregular metal fragments of all kinds, as well as by corrosive fluids and irritant and poisonous gases.

From the size and solidity of their fragments and their enormous concussive violence and detonation, shells are used mainly to demolish cover, to break down wire entanglements, and especially to search out the depths of trenches, their downward trajectory after bursting making them especially effective here. The explosive force of picric acid and of trinitrotoluol, which are most often used as bursting charges, is 135,820 and 119,000 pounds per square inch, respectively, which explains the terrific action of concussion often seen upon the central nervous system and in the eyes of those who survive its effects or only partly sustain them. Shells charged with picric acid produce volumes of black smoke on detonation, the asphyxiant carbon monoxide and the corrosive nitrous oxide gas being evolved from the picric acid compounds in the process and both being accessory instruments of death or injury in the stagnant air of the trench depths.

It is evident that facial wounds are far more often the product of the more frontal shrapnel trajectory than of the more overhead shell explosion, and that shell fragments produce grosser lacerations which more nearly resemble the great traumas of railroad accidents. Soft tissues are bruised to a pulp, bones are crushed and splintered as if pounded, and wide areas of muscular tissue die and may be cut away without pain or bleeding. A characteristic of these wounds is the formation of numerous "pockets" owing to the separation of muscle layers along the fascial planes, a matter of great importance if infection is allowed to gain a foothold. Surgical experience has shown that the larger and the more irregular the missile, the greater the probability of infection from the larger amount of tissue torn and exposed, and as shell fragments are always very rough and jagged, these wounds are nearly always found infected, streptococci and staphylococci being invariably present, with the fecal organisms of tetanus and gas gangrene frequently superadded.

The larger naval and armor-piercing guns have been introduced in land operations during this present war, but their effect upon human tissue is one of such extreme laceration that their only relation to lesions of the optic

apparatus comes through those factors common to all types of artillery projectiles, *i. e.*, through the mechanical and psychic effects of detonation or of explosive violence and through the production of clouds of secondary missiles.

3. *Bullets* cause the majority of the more serious wounds of the eyes and the optic apparatus, as is shown by the fact that not more than from 25 to 30 per cent. of eyes wounded by bullets can be saved, whereas about 60 per cent. of those injured in explosions of artillery missiles are conserved, although the vision in all of these retained eyes is usually much impaired. A comparison between the results of 118 cases of eyes wounded by artillery explosions and under the care of Cords with those of 406 bullet wounds of the eyes treated by v. Grósz shows that enucleation was necessary in about 27 per cent. of the former and 39 per cent. of the latter; intra-ocular foreign bodies were found in over 33 per cent. of the artillery and in 7 per cent. of the bullet wounds; of the conserved eyes, unilateral blindness existed in 58 per cent. of artillery and 11 per cent. of bullet injuries, while both eyes were blind in about 6 per cent. of the former and about 11 per cent. of the latter wounds. Because of the position of the head in trench fighting, wounds of the head and face are probably the most frequent of all injuries in modern battle, and the terrific energy developed by the modern bullet at short ranges has been no small factor in the unprecedented mortality from these wounds. Some idea of the force of impact of the modern pointed bullet may be gained when it is understood that the 10-gram German bullet of ferro-nickel has a muzzle velocity of over 2,900 second-feet and revolves on its long axis, its boring motion, about 2,500 times per second. In terms of energy, this means that at 100 yards the bullet has a working force capable of raising a weight of over three-quarters of a ton to a height of one foot; at 300 yards a half ton would be raised an equal distance, while at 600 yards the force drops to about 600 foot-pounds. As a blow of only 60 foot-pounds is sufficient to kill a human being, it becomes obvious why so few, relatively, of the short-range bullet wounds of the cranium figure

in the lists of the wounded who arrive at the base and reserve hospitals.

The modern bullet tends to flow out of shape and to fragment upon meeting slight obstructions, because of the difference in the density of its core and its thin outer coat or jacket. Further, because of its deliberately imperfect balance, it has a wobbly, gyrating motion during the first 800 yards of its flight, as well as when nearly spent. This imbalance often causes the bullet to somersault or turn on its axis when it meets the least resistance, and if this resistance be that of the tissues, the oblique, transverse or reversed projectile assumes the lacerating proclivities of a dum-dum bullet, producing the deep, irregular wounds, often with large cavities in the softer tissues, known to the French as *"anfractuous"* wounds. The rotary spin of the bullet, produced by the rifling, continues to the end of the penetration, regardless of the reversal of the butt, and Mills is convinced that the cavities, filled with blood and bruised tissue, so often found about lodged bullets in all parts of the body, including the orbit, are due wholly to the persistence of this rotation after the bullet's advance has been checked. In a certain number of cases of rupture of one or more of the ocular coats by indirect violence, the possibility that transmission of this rotary force may be responsible for the damage has been suggested. As the modern bullet rotates around its length axis once in approximately every 3 feet of space traversed, the ratio of rotation to distance traveled, about ⅓ to ½ of a turn in passing through the body, seems much too small to give this rotary motion much, if any, standing as a force effective for trauma.

According to Delorme, about one-third of all bullets ricochet, and this is especially the case in trench fighting, where the bullets strike sandbags and the innumerable forms of parapets at all angles, the impact on rock or metal often breaking the mantle, with extrusion and spattering of the core, and either from this cause or from the oblique axis at which the undeformed bullet hits, producing the so-called "explosive" effect so characteristic of modern bullets. The real explosive bullet, which explodes on impact, naturally does not ricochet.

On the other hand, projectiles of very high velocity which have not ricocheted, not infrequently cause explosive effects by breaking up during their course through the tissues, as the result of the thinness of their outer jackets and the different density of their cores.

The more or less complete shattering of the eyeball when directly hit by a bullet is due to the transmission of the velocity of the missile to the incompressible fluid contents of the eye, and the general law may be laid down that, velocities being equal, the smaller the eye, the greater the destruction, the addition of the volume of the bullet to that of the fluid producing a greater increase of pressure in the smaller eye.

The bullets of modern rifles, machine guns and high-powered revolvers produce nearly identical effects upon the orbital region and the cranium at short range. Condensed bone, like that of the superciliary ridges, the external angular processes and the whole lower jaw, are subject to extreme comminution, the degree of which is in direct relation to the caliber and velocity of the bullet and the condensation of the bone. In general, the higher the velocity, the more limited in length the fracture and the greater the comminution, and the extremes of this effect are nowhere more marked than in shot wounds of the skull at close ranges. Reconstruction of these skulls shows that the modern, undeformed bullet often passes completely through the skull and emerges before the collapse of the cranium occurs, and further demonstrates that this shattering of the cranial vault is the result of the interlacing of radial and circular fissures which arise from both the wounds of entry and of exit, thereby converting the dome into a myriad of fragments which collapse or fly apart under the continued energic action of the projectile, as transmitted to the semi-fluid brain.

When the bullet is moving evenly, at about 1,000 yards or over, if it hits without having ricocheted, it is likely to make clean perforations of the orbital buttresses and the skull, although such wounds are relatively uncommon, owing to the conditions of modern warfare.

It is worthy of note that portions of some bullets,

like the casing of some forms of shrapnel and shells, are magnetic. The jacket of the German rifle bullet, made of steel, with over 30 per cent. of nickel, is strongly magnetic, although the body, containing 97 per cent. of lead and 3 per cent. of antimony, is, of course, non-magnetic. The jacket of the English bullet, being made largely of copper and nickel, is also non-magnetic.

Remote injuries of the optic apparatus, such as wounds of the cilio-spinal sympathetic circuit, of the cortical visual centers and deep wounds of the optic tracts and radiations, are caused mainly by bullets.

A brief consideration of the *infections of modern warfare* and of the *principles of military surgery,* in so far as they apply to wounds of the optic apparatus, may precede the regional study of these wounds.

Careful clinical and bacteriologic study of battle wounds has solidly established the following facts:

1. The prevention and cure of infection constitute the greatest single problem of military surgery.

2. Little or no bacterial growth occurs in projectile wounds during the first four to six hours following injury. Such as does occur comes mainly from implantation of organisms with the projectile or secondary missiles, and where these wounds can be effectually opened and cleansed of foreign material before bacterial growth extends to and into the surrounding tissue, infection does not occur, or is almost negligible.

3. Wherever, from the nature of the wound, it is possible to excise the bruised and contaminated tissue about the path of the missile, the usual result is primary union.

4. If, owing to faulty transport, excessive casualties, or extreme shell shock or exhaustion, prompt surgical care is impossible and infection spreads to all parts of the wound, free incision, adequate drainage, the use of light dressings, frequently changed, and continuous irrigation offer the surest means of recovery.

The use of antiseptic solutions in battle wounds has undergone much revision as the result of the researches of Almroth Wright, Carrell, Dakin and many others, who have shown the uselessness of merely washing pus out of infected wounds without directing treatment to

the walls of the wounds where the delicate biologic changes of tissue resistance to bacteriologic invasion are taking place. Two solutions stand out among the many advocated for continuous irrigation and wet dressing: Wright's solution of 5 per cent. sodium chloride with 1 per cent. sodium citrate has for its object the "lymph lavage" of the infected tissue by introducing this fluid of high osmotic properties freely into every part of the wound, while Dakin's solution of sodium hyperchlorite, similarly employed, is an effective antiseptic without the albuminotropic properties, which make solutions of bichloride of mercury or of iodine or phenol objectionable. Dakin's solution is made by adding 200 grams of chlorinated lime to 5 liters of tap water, allowing it to macerate over night. To this is added a solution of 100 grams of anhydrous sodium carbonate and 80 grams of sodium bicarbonate in 5 liters of cold tap water, the mixture is stirred vigorously for a minute and then the calcium carbonate is allowed to precipitate. After a half hour, the supernatant fluid is filtered through paper and is ready for use without heating. The value of these solutions in uncomplicated wounds of the globe is untried, or at least unreported, but in the gross, infected lacerations which so commonly involve the orbital and adjacent tissues, their worth, and particularly that of the chlorine compounds, is inestimable when continuously applied. Wright suggests the use of a light, water-tight trough of formalin-gelatine to protect the skin from maceration and irritation and to avoid soaking the clothing and bed. This is built upon the skin by soaking short strips of bandage in a solution of 40 grams of gelatine in 200 c.c. of water, to which is added 20 c.c. of ordinary 40 per cent. formalin. These short lengths of bandage, overlapping each other, are pasted over a half-moon of cotton, bent beneath the wound, and when dry, form an effectual confining channel firmly fixed to the patient's skin.

Another good review of this subject—which is here largely abstracted—is by John Green.[4] He points to the fact that when the surgical history of the great European war comes to be written, one outstanding

(4) Interstate Med. Jour., July, 1916.

feature will undoubtedly be the *great preponderance of injuries of the head and head structures.* This is obviously due to the almost universal adoption of trench warfare, in which the upper part of the body is most exposed to projectiles of all sorts. Injuries to the eyes and adnexa, and impairment of vision or complete blindness due to wounds of the cortical visual area have been correspondingly frequent. The present review is concerned largely with English and French contributions to the injuries of eyes in warfare.

Ormond has found that exceedingly minute fragments of metal, gunpowder, sand, etc., may be driven into the eyeball by shell explosions. Often the tiny wounds heal rapidly and the incident is soon forgotten. Two cases are related of soldiers invalided home with the diagnosis "iritis." Both showed intra-ocular foreign bodies to the *x*-ray, and the eyes were removed to insure against sympathetic inflammation.

Lister is of the opinion that very little can be done for eyes containing foreign bodies because many of them fail to give visible shadows with the *x*-ray, practically none are of a magnetic nature, often more foreign bodies are present than have been diagnosed, and even when they can be reached they often break in the grasp of the forceps. He believes that an eye containing a foreign body does not endanger its fellow unless there is entanglement of uvea or lens capsule. He prefers to defer enucleation "until the eye does not see." De Lapersonne notes that foreign bodies in the eye resulting from military injury more frequently give rise to suppuration, severe iridocyclitis, etc., than do such injuries in civil life.

Mackenzie-Davidson has devised an ingenious telephonic device to detect the presence of non-magnetizable particles in the eye and orbit. The action of the telephone depends upon variable currents passing through the coil of wire which is wound around one pole of a permanent magnet. These currents cause variations in the magnetic strength and lead to the attraction and release of a small thin iron disc placed in front of the magnet, the vibration of the disc resulting in the emission of sound waves.

The best results were obtained by using an indifferent electrode (carbon depolarized by washing in iodine solution) fixed in position on the skin. To this one end of the telephone wire is attached; the other is attached to the surgical instrument (a needle, probe, forceps, scissors, knife). The moment the exploring instrument touches the fragment, a microphonic rattle is heard. Several cases are related of the successful use of this device in locating foreign bodies within the orbit.

De Lapersonne and Ormond have noted the extreme destructiveness of transverse bullet wounds of the orbit. Seven out of fifteen such cases resulted in bilateral blindness (de Lapersonne). On the other hand, it is possible for a bullet to traverse the orbit and do a minimal amount of damage. In cases related by Roll and Adams, bullet wounds of the orbit produced only indirect injury to the eye with the formation of the so-called "hole" at the macula with central scotoma but with preservation of a good field.

It is generally agreed that sympathetic disease is extremely rare. Jessop and Evans having encountered no cases. Ormond relates one case only which rapidly cleared up on removal of the offending eye. De Lapersonne is agreed that grave sympathetic is rare but describes an insidious form which comes on very gradually, leading to grave consequences.

Certain "commotion" effects have been noted after trifling injuries to the cornea or conjunctiva, *e. g.*, severe iridocyclitis.

In Jessop's experience, very slight swelling of the disc and retina adjacent is apt to follow depressed skull fracture due to bullets or shrapnel. Retinal hemorrhages are generally absent. Visual and color fields are normal. Five or six days after decompression most of the papilledema has disappeared and it is entirely gone in from fourteen to twenty-one days. Choked disc is probably present in all cases of injury to the vault of the skull provided increased intra-cranial pressure is present.

Lister found that in 50 per cent. of bullet wounds of the head, even grazing wounds of the skull, there was papilledema. He does not feel that the mere presence

of papilledema is in itself sufficient warranty for operation. He urges frequent ophthalmoscopic examinations.

Milner relates the cases of two soldiers, both of whom received bullet wounds in the occipital region, resulting in temporary complete blindness (double hemianopsia). Recovery of vision took place with the exception of the left lower quadrant of the field. Symptoms are ascribed to damage of the lower part of the cuneus or the mesial surface of the right occipital lobe. He offers two possible explanations for the double hemianopsia: (1) hemorrhage along the mesial aspect of the occipital lobes, and (2) profound but transitory shock which makes itself felt in both occipital lobes, and temporarily paralyzes the function of the visuo-sensory apparatus. Moore describes a case in which a bullet passed through both occipital lobes, causing immediate blindness. On the fifteenth day vision was restored to reading print with limitation of the right field. Pulse at first 44, raised to 84. The temporary blindness was thought to be due mainly to concussion.

Lister notes that in injury to one occipital cortex there is either hemianopsia or homonymous quadrant anopsia of the opposite side. When there is injury to both occipital lobes there is at first complete blindness often clearing up so that eventually there may be central scotoma with full peripheral field.

Temporary blindness and permanent symmetrical changes in the visual field are explained on von Monakow's last theory of diaschisis: "The injury produces diaschisis or shock on the systems and groups of neurons anatomically and functionally correlated with the cortical neurons damaged or destroyed. In these occipital cases the 'initial' phase of the diaschisis is blindness due to the fact that the shock of the injury to the occipital area of the brain on the side of the lesion is transmitted by commissural fibers to the correlated occipital area on the other side. As, in these cases, each area presides over half the field of vision in each eye, the effect of shock on the areas on both sides is blindness. After a time, depending on the condition of the brain, the shock tends to pass off, and the regressive 'phase' is entered on. The correlated center on the opposite

side of the brain to the lesion recovers generally completely, and we are left with the 'residual' phase."

Very few cases of detachment of the retina following military injury have been noted; the incidence seems to be much less than in civil life.

Ormond has noted the return of miner's nystagmus under the exigencies of service. He feels that all individuals with nystagmus should be excluded from the ranks, as they are unable to shoot straight and may menace their own men in flanking operations.

Cosmettatos[5] gives an interesting account of the ophthalmic injuries seen at the base hospitals at Previsa and Salonika during the Greco-Turkish and Greco-Bulgarian wars. One hundred and eighteen of the 13,635 treated in this hospital suffered from ocular injuries; 43 were caused by bullets from rifles and machine guns, 4 by shrapnel bullets, 68 by fragments of shells or pieces of wood or stone thrown up by shells, 3 by dynamite explosions. There were 29 cases of complete destruction of the eye, 17 of total loss of vision, 22 of partial permanent blindness and 13 of partial temporary loss of vision. In 42 cases the wound involved one structure of the eye; in 76 two or more structures. Of the 29 cases of total destruction, 12 were accompanied by fracture of the orbit.

An interesting discussion took place between Valude and Morax on the management of traumatic cataracts in soldiers. Valude insists that the patient should be discharged from the service or at least transferred to the auxiliary forces and that operation should be deferred until the danger of postoperative iritis is reduced to a minimum (excepting cases complicated by secondary glaucoma or the presence of a foreign body). He avers further that no matter how successful the operation may be that it does not make the patient fit to return to the firing line. Morax, on the contrary, states that he knows of individuals who after removal of cataract from the left eye have returned to the firing line. After operation the visual field for orientation is restored. An eye with a cataract diffusing light is more

(5) Archiv f. Augenheilk., Vol. 78, p. 129; abstracted by Hanford, in Brit. Jour. Ophthal., February, 1917.

disturbing to the sight than an aphakic eye without a correcting lens. A number of officers have remained in service after losing the sight of one eye. He believes that the risk of operation is not reduced by undue postponement. His own practice is to operate whenever such interference is not definitely contraindicated.

In regard to treatment, de Lapersonne advises complete rest in bed, the administration of antitetanus serum in all cases, flushing the eyes with physiologic salt solution, the use of peroxide of hydrogen, potassium permanganate and iodoform as antiseptics. He believes that better results are obtained from not suturing lacerated lids. He is a firm believer in the conjunctival flap in corneal wounds.

Jessop thinks that all eye wounds should be regarded as septic and treated antiseptically, but that operations should be conducted aseptically.

Lister describes the action of rifle and of shrapnel bullets on the eye. The eyeball is often ripped open, its contents evacuated, and it is torn into strips like the petals of a flower. In enucleating such an eye, it is well to grasp each petal separately, draw it forward, and then remove the muscle attachments. In orbital cellulitis and panophthalmitis, Lister has devised the following operation: The cornea is removed and the globe is eviscerated. The muscles are then divided and the sclera is cut so as to leave a frill of 5 mm. in diameter around the uncut optic nerve. The special advantages of this procedure are that there is no danger of meningitis, no shock, the bleeding is less, there is free drainage for any cellulitis, and healing is more rapid than after simple evisceration.

Pooley describes a somewhat similar procedure. He throws back a cuff of conjunctiva to the insertion of the tendons. He then cuts off the anterior segment of the globe just behind the ciliary body and scrapes out the contents of the globe. In this way he avoids opening Tenon's capsule.

Jessop describes cases of temporary blindness occurring in men near whom a severe explosion had occurred. The eyes were normal in all respects. Psychic shock due to violent emotion or commotio cerebri from mechan-

ical causes, such as "windage," are given as probable causes. Similar cases are described by Ormond.

Under the term "shell shock" Lister describes various ocular phenomena, such as color sensations, blepharospasm and night blindness. The pupillary reactions remain normal (Pooley). Adams notes that under the strain of trench life, latent hyperopia becomes manifest, with a consequent decrease in accurate marksmanship. Spasm of accommodation has been observed under similar conditions.

Twenty-eight totally blind men came under Ormond's observation; twenty-one of these cases were due to bullet wounds which, for the most part, traversed the front part of the head. Four were due to shrapnel. Great disorganization of the globe was noted in cases in which the eyeball had not been touched; vitreous was found filled with glistening white masses (old blood-clots). Ruptures of the retina and chorioid, which were quite common, are explained by Nettleship by assuming that the force of the projectile, in passing through soft tissues, give rise to vibrations which radiate from the axis of the bullet track. These act as "secondary missiles," and while unable to cause disintegration of the dense sclerotic, pass through it with sufficient force to rupture the chorioid and retina.

Ormond notes that these men, far from being depressed, are unusually cheerful. They are apt to take the view that they are lucky to have escaped with their lives. This frame of mind is due to the policy of keeping these men together, establishing, as it were, a community of interest and sympathy. Industrial training is quickly undertaken, so that before the period of depression arrives, they will be, to some extent, self-supporting and self-dependent.

Etiology of Ocular Lesions Due to War Projectiles. Morax and Moreau[6] have investigated, and Coulter[7] has reviewed their article on the character and *modus operandi* of the projectiles which injure the visual apparatus, with a view to devising means for its protection.

The statistics are founded on 698 cases which were all

(6) Ann. d'Ocul., August, 1916.
(7) Brit. Jour. Ophthal., February, 1917.

examined at the Lariboisière Hospital under similar conditions. The wounds were caused as follows:

By shells, 341; by rifle or machine gun bullets, 191; by grenades, 82; by bombs, petards, aerial torpedoes, etc., 63; by shrapnel bullets, 20; by cold steel, 1.

These various bodies may injure the visual apparatus in five ways, *i. e.*, by contusion, direct or indirect; by rupture of the ocular membranes, with or without penetration; by infection of the globe; by section of the optic nerve; and, by intra-cranial lesion of the optic paths. Lesions by direct contusion are chorioido-retinal ruptures, hemorrhages, and edema, and are important from their frequence, and because they usually cause permanent functional damage. They may be caused by quite small fragments of shells, grenades, or bombs, or even by earth or stone thrown up by the explosion of a shell or grenade. Lesions by indirect contusion cause tears in the iris, traumatic cataract, retinal hemorrhages, and zones of depigmentation, usually called "ruptures" of the chorioid, although it is probable that a rupture is not always present. Lesions by rupture of the membranes usually give rise to complete loss of the eye, but small bodies may penetrate the eye and remain in it, causing variable amounts of damage without total loss of vision. Infection occurs when a small body penetrates the eye without at once destroying the sight. The infecting organism may be an earth germ (*B. perfringens,* etc.,) but more commonly it is carried in from the conjunctival sac (pneumococcus). Lesions of the optic nerve or motor nerves are rare in comparison with lesions of the globe itself. Intracranial lesions are not of importance for the purpose of the author's investigation, as the *casques* in use provide protection against them.

For the purpose of investigating the nature of the injuries caused by the different varieties of projectiles, the authors have made an arbitrary division of the latter into three classes: (1) *Small,* weighing less than 0.25 to 0.30 grams; (2) *medium,* weighing 0.30 to 5.00 grams, and (3) *large,* weighing more than 5 grams. The last class include shrapnel and rifle bullets, which weigh from 8 to 10 grams. Bodies belonging to this class

usually traverse both the walls of the eyeball and, in addition, wound the eyelids and pass through some of the thin bones surrounding the orbital cavity. In cases in which lesions of this grade have been produced, but the wounding body has not been found, the authors have inferred its size from the injuries caused by it. Medium fragments frequently cause double perforation of the eyeball, but do not usually pass through the walls of the orbit. They may cause concussion injuries. Small fragments rarely penetrate deeply into the orbit, but may pierce the lid and sclerotic and become lodged in the globe, but once there have not sufficient force to pierce its second wall.

A further category of injuries is caused by a multitude of tiny metallic fragments forming a regular metallic dust which tattoos the skin of the face, the cornea, and the conjunctiva and may even penetrate to the iris or lens. The 341 cases of injuries from fragments of shells were divided as follows among these three classes: Large, 75; medium, 96; small, 170. Of 82 grenade wounds, 57 were caused by small fragments, and 25 by large or medium; and of 63 injuries by trench projectiles 38 were caused by small fragments, and 25 by large or medium ones, or, adding the lot together, of 486 injuries, 265=54 per cent., were caused by small fragments. Injuries by rifle or shrapnel bullets.—These numbered 211 (191 rifle and 20 shrapnel). In most cases they caused destructive orbital-palpebral-ocular lesions, but 55 of them (42 rifle bullets, 7 fragments of rifle bullets and 68 shrapnel bullets) caused ocular contusions. In 38 of the 191 cases of injury by rifle balls, the projectiles were split into small masses or even dust, tattooing the lids and cornea, and giving rise to minute penetrating wounds with traumatic cataract, etc.

The functional results of the injuries were as follows:

Homonymous hemianopsia from cranial traumatism....	14 cases
Enucleations hemianopsia from cranial traumatism....	293 "
Vision lost or less than 1/20 from cranial traumatism..	194 "
Vision between 1/10 and 1/20 from cranial traumatism.	36 "
Useful vision retained or regained from cranial traumatism	160 "

As the result of their investigation, the authors consider that, although no practicable protective apparatus could be of use in stopping bullets or large splinters of shell, almost half the ocular injuries in war caused by small bodies, which could be stopped by some sort of gauze shield, which might also stop spent or almost spent fragments of medium size. Unfortunately, such an appartus would more or less diminish the visual acuity of the soldier wearing it, but a shade could be worn protecting the temporo-orbito-nasal region and perforated by an opening a little larger than the cornea, which would reduce the vulnerable zone by about three-quarters.*

Protective Masks for the Eye in Warfare. The problem as to the best protection for the eye under conditions of actual warfare has been studied by V. Morax and F. Moreau[8] who discuss various methods for the direct protection of the eye by means of a screen of "armored" glass (*verre armé*); also a mask of perforated metal. The question of sight through these masks is also considered. The authors advise one or more of the following plans: The use of a protective mask with simple unscreened eye holes, or peri-ocular protection; the use of discs of armored glass placed in front of the cellophane discs in the eye-hole employed against irritating gas; the use of a mask with double screens of perforated metal, or ocular and peri-ocular protection against small steel and copper projectiles; the use of a mask with screens of armored glass, *i. e.*, ocular and peri-ocular protection against small steel and lead projectiles.

Serious Burn of the Eye from Liquid Caustics Used in War. Two cases are reported by Paul Petit[9] in which the eyes and eyelids were seriously injured by some liquid caustic, which he supposes to be analogous to phosphoric acid. Both men were wounded by a bursting shell, which probably contained some liquid intended to generate asphyxiating vapors, and the contained liquid was thought to be the agent whereby the eyes were damaged. In each patient one cornea rup-

(8) Clin. Ophthal., June 10, 1916; abstracted in Brit. Jour. Ophthal., February, 1917.

(9) Ann. d'Ocul., November, 1916; abstracted in Brit. Jour Ophthal., February, 1917.

tured, and the eye had to be enucleated. He has not so far seen any similar cases, although his experience among wounded soldiers has been large.

Traumatic Cataract in War. A large experience in these cases is reported by Rollet and Velter.[1] These observers have seen 237 traumatic cataracts among 24,990 eye patients; 123 of the 237, were operated on. These traumatic cataracts are to be divided into two groups: (1) those without wound of the eyeball; (2) those in which the eyeball is wounded. Of contusion cataracts there were 40 out of the 237 cases. As a rule, the authors are of opinion that no operation is preferable to intervention.

Of the forty patients, fourteen were operated on. Of cataracts accompanied by wound of the eyeball there were 197 out of the 237. The treatment of these falls under two heads, those with and those without an intraocular foreign body. Of these 197 cataracts with wound of the eye, 109 out of the 197 were operated on. Of these 109 there were eighty-nine without a foreign body and twenty with a foreign body. Of the eighty-eight patients not operated on, seventy-seven had no foreign body, and eleven had.

The authors then consider the various points influencing treatment under the following headings: (*a*) Foreign body situated in the lens itself; (*b*) deeply situated in the eye; and, as regards those cases without foreign body, (*a*) the site of the wound, (*b*) the state of the lens, (*c*) the tension, (*d*) concomitant lesions, and (*e*) infection.

The state of the second eye in the 123 operated on was as follows: 14 contusion cataracts and 109 cataracts complicated with wound.

Other eye normal, seventy-nine cases; other eye cataractous, six cases; other eye mild lesions, twenty-four cases; other eye severe lesions with V.=0, or enucleated, fourteen cases.

The Factors in a Decision for or against Operation in Military Traumatic Cataract. In another commu-

(1) Clin. Ophtal., June 10, 1916; abstracted in Brit. Jour. Ophthal., February, 1917.

nication[2] the same authors state that they are influenced by the following considerations:

The state of the lens: Contusion cataracts are frequently incomplete, the opacity being rarely nuclear, but usually anterior or posterior capsular. As its situation is often excentric, a certain amount of vision is often present, which, if not good, is at any rate of some service. Operation should be reserved for those cases in which the opacity is complete. Operation should always be performed when the lens is dislocated into the anterior or posterior chamber. It is to be regretted that the authors give no details of the operative procedures they advise in the case of dislocated lenses.

The state of the intra-ocular tension: Hypotony is an absolute contra-indication to operation, even if the cataract is complete, since it often indicates a latent iridocyclitis which is liable to be stirred up by any operative interference. In the opposite case of raised tension operation may be necessary, but in many cases, especially if spontaneous absorption is taking place, the tension will yield to the use of miotics. The risks of producing adhesions in cases with a swelling lens, seem to us to outweigh any possible advantage in their use, nor would they be of much use unless the rise of tension was but little.

The co-existence of other ocular lesions, such as iridodialysis, vitreous or retinal hemorrhages; retinal detachments or chorioidal ruptures: As there is no hurry, it is well to wait in such cases and see if spontaneous absorption may take place.

The state of the other eye must be taken into account: If that has been lost, or its visual acuity is very low, operation is certainly indicated, all the more so as the postoperative anisometropia, troublesome if the fellow eye is sound, will not have to be taken into account.

The authors had forty of these contusion cataracts to treat and operated on fourteen; the remaining twenty-six were not operated on either because the cataract was accompanied by other severe ocular lesions or was only partial.

(2) Bull. de la soc. Francaise d'ophtal. de Paris, July, 1916; abstracted in Brit. Jour. Ophthal., February, 1917.

Cases of the second class, in which there is a wound of the eye, are divided into two main groups, according to the presence or absence of an intra-ocular foreign body.

1. Traumatic cataracts with an intra-ocular foreign body: The first indication, according to the authors, is to submit the patient to the action of the magnet in the hope of dragging the foreign body round the lens if it should prove magnetic. Nothing is said about accurate localization by radiography, which should surely be the first step, even if the somewhat rough method of attempting to drag the foreign body forward is adopted.

The situation of the foreign body is noted as of importance. It is stated that the diagnosis of a foreign body situated in the lens is always difficult and only to be made by radiography, a statement surely applicable to all intra-ocular foreign bodies. As a foreign body in this situation is frequently very small and firmly fixed in the lental substance, extraction by the magnet is often unsuccessful. In such cases it is advisable to wait until the cataract is complete, and then to remove the lens matter and the foreign body at the same time. The known tolerance of the lens for a small foreign body, and the rarity of infection in such cases, support this course of action.

When, on the other hand, the foreign body is in the deeper parts of the eye, a magnet operation must be undertaken at once. Should this prove successful, and the inflammatory symptoms subside, the extraction of the cataract may follow at the most suitable period. During the extraction of the foreign body some of the soft lens matter will probably be removed and the remainder may then be left to be absorbed. If, on the other hand, the removal of the foreign body is not successfully accomplished, one of three results follows.—The eye lost as a result of inflammatory changes of a rapid nature, which as an exceptional rarity, may lead to sympathetic ophthalmia; organization of the vitreous takes place round the foreign body and light perception is gradually lost without any inflammatory change of an active nature; or, finally, the eye may quiet without loss of vision and an attempt may be made to extract

the cataract after a sufficient interval has elapsed. The authors removed the cataract in twelve cases in which they had failed to remove the foreign body, and succeeded in one case in obtaining vision better than 1/4, in three cases between 1/4 and 1/20, and in the remaining eight less than 1/20. On the other hand, in six cases in which the removal of the foreign body had been successful, two patients had vision better than 1/4, two between 1/4 and 1/20, and two worse than 1/20.

The greater number of patients had no foreign body present (166 as against thirty-one with foreign bodies). In these cases the indications for operation depend on the seat of the injury, the state of the lens, the intra-ocular tension, and the accompanying injuries of the globe, with special reference to the presence of infection.

In the majority of cases, the injury will be found in the anterior segment of the eye and may consist of a small opening which has rapidly closed with a small inclusion of iris. This latter, it is suggested, may be cauterized; a method of treatment which has proved disastrous in civilian practice and which the authors state should never be attempted. When the wound is large and prevented from closing by lens matter and prolapsed iris, immediate operation is necessary to free the iris and to remove the lens matter. The cases are usually not seen soon enough after the injury to render suture or conjunctival flap grafting of much use. As regards the condition of the lens and the intra-ocular tension, the procedure recommended does not differ from that adopted in the case of contusion cataracts. Accompanying lesions are of importance in so far as they affect the results that may be expected from successful operation; it is obviously useless to operate on an eye in which the perception of light is lost.

No eye should be operated on that shows signs of a quiet iridocyclitis, especially if the tension is subnormal, until a considerable period has elapsed.

One hundred and sixty-six cases of cataract with wound of the eye were dealt with. Of these, eighty-nine patients were submitted to operation with the following results: Vision 1/4 and better, twelve cases; vision 1/4 to 1/20, thirty-six cases; vision 1/20 to 1/50,

eighteen cases; vision less than 1/50, twenty-three cases. No cases of postoperative infection were observed.

Ocular Protheses in the Army. Cosse,[3] who is in charge of the French Army Ophthalmic Center at Chartres, has had great difficulty in getting artificial eyes for the soldiers under his care who have required enucleation, especially in cases in which the socket is contracted or deformed, owing to injuries to the eyelids or suppuration.

To overcome this, he takes a cast of the socket in the dentist's white paste, known as "Crown composition." This is softened in warm water and the cocainized socket is filled with it, massage being applied through the lids to force it into all the recesses. When the composition has become fixed, it is removed and trimmed. It is then replaced in the socket, and the position where the center of the pupil should be situated is marked on it. The whole process can be carried out in two or three minutes. The author claims that by sending this cast, together with particulars as to the color of the iris and conjunctiva and the size of the cornea and iris, to the artificial eye maker, a satisfactory prothesis can be obtained, even in very difficult cases. He further finds that if the cast is worn for a time, the size of the socket increases, so he lets his patients wear the first cast for several days and takes a second one before he orders the prothesis. In several cases of contracted socket he has been able to get sufficient enlargement to allow a prothesis to be worn by getting the patient to wear casts of increasing size.

He claims that his method is easy and cheap, that it enables a prothesis to be obtained for abnormal cases, and has therapeutic value in restoring a contracted cul-de-sac in certain cases.

Oblique Hemianopia from Gunshot Wound of the Chiasma. As one example of projectile traumas of the intracranial ocular apparatus—and the World War has produced many—Purves Stewart and A. D. Griffith[5] give the following account of wounds of the chiasm:

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(3) Ann. d'Ocult., July, 1916; abstracted in Brit. Jour. Ophth., February, 1917.
(5) Lancet, July 15, 1916.

The patient, aged 24, was wounded on Jan. 5, 1916. He had multiple shrapnel wounds. One metallic fragment had entered through the right upper eyelid, destroying the right eye and lodging within the cranium, where radiography showed it to be about a quarter of an inch above and a quarter of an inch in front of the upper limit of the sella turcica. It had crossed the mesial plane and was lying half an inch to the left of the middle line. When hit the patient immediately became unconscious and had a subsequent period of amnesia which lasted for several weeks throughout the attack of septic meningitis which followed. Two days after his injury, on board the hospital ship, it was noted that he was completely blind and that the pupil of the uninjured left eye was widely dilated and insensitive to light. The signs of severe meningitis rapidly increased, with headache, delirium, pyrexia, and head retraction. For the first ten days the patient seemed moribund, and minute observations on his eyes were impossible. He then began to improve and was more carefully examined on January 17—*i. e.*, twelve days after the injury. On this day the temperature, which since admission to hospital had been swinging between 100.8° and 103.4° F., was 101.8°. The pulse, which had varied from 88 to 100, was 96. The patient was able to reply intelligently to questions, although still at times mildly delirious. He complained of headache and cervical rigidity. The right eyeball was completely disorganized and suppurating. The left eye had no perception of light and its pupil was widely dilated and insensitive. The left optic disc and fundus were normal. In particular, there was no pallor of the disc and no suspicion of optic neuritis. The cranial nerves were otherwise normal. There was no sensory or motor paralysis of the face, trunk, or limbs. The knee-jerks and ankle-jerks were normal. The plantar reflexes were of the normal flexor type. Kernig's sign was well-marked. The cerebrospinal fluid was opaque and milky; on standing it showed a thick deposit of pus. The meningitis gradually subsided during the next six weeks under treatment by urotropine internally, together with lum-

bar punctures on alternate days, the cerebrospinal fluid becoming normal.

On January 29 the right eye was excised. The globe was found to be full of blood clot. There was no obvious suppuration within the orbit. On February 4—*i. e.*, a month after the injury—it was observed that some vision had returned in the left eye, in the nasal half of the field, so that the patient could distinguish hand-movements close to the eye. On February 18, when the meningitic symptoms had subsided and the cerebrospinal fluid had become almost clear, the hemianopia of the left field was confirmed. From February 24 onward the temperature remained steadily normal. On March 1 the lumbar punctures were discontinued.

On March 9 a more careful examination of the left eye was made. The optic disc was then diffusely pale

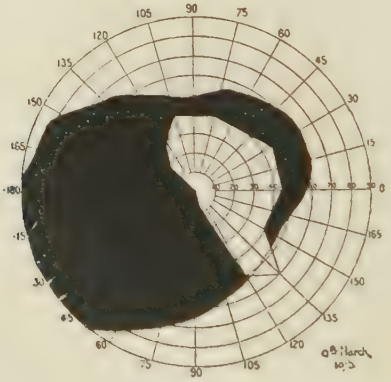


Fig. 43. Visual Field of the Left Eye on March 9th.

and atrophic. The left pupil was widely dilated and showed a typical hemiopic reaction—*i. e.*, when a pencil of light was thrown on the sensitive temporal half of the retina the pupil contracted, whereas a similar pencil of light thrown on to the blind nasal half of the retina produced no reaction. The boundary between the blind

and the seeing halves of the visual field was not vertical but oblique, running through the 120° meridian (Fig. 43).

On March 13 this obliquity of the hemianopic boundary was confirmed, and a slight gain of vision was detected in the blind half of the field, close to the fixation-point (Fig. 44). On this day the vision was 1/60. By March 21 the vision had further improved to 5/60, and the visual field had also extended

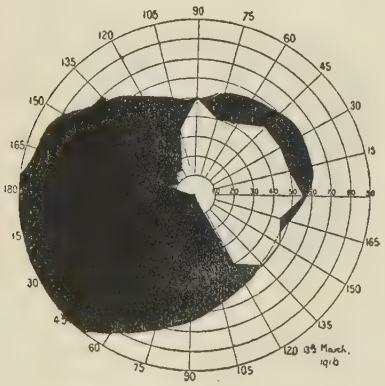


Fig. 44. Visual Field of the Left Eye March 13th.

slightly more into the blind area, both horizontally outwards and also, in the 105° meridian, downwards and inwards (Fig. 45) where the field had widened from the 8 circle to the 30 circle. Moreover, there was now a little vision directly downward, and even a trace in the 75° meridian downwards and outwards. On the 23rd the pupillary reaction was no longer typically hemiopic, for now the pupil contracted to light thrown in from either side, although more briskly to light from the seeing half of the visual field.

Further observations, however, showed that it was not so simple as this.

Let us recall, for a moment, some points in the anat-

omy of the visual path. The fibers from each optic nerve run backwards to the optic chiasma. Here a partial decussation occurs (Fig. 46), so that the fibers from the right halves of both retinae—*i. e.*, from the left halves of both visual fields—after traversing the chiasma, emerge behind it to form the right optic tract. Similarly with the fibers from the left halves of the retinae,

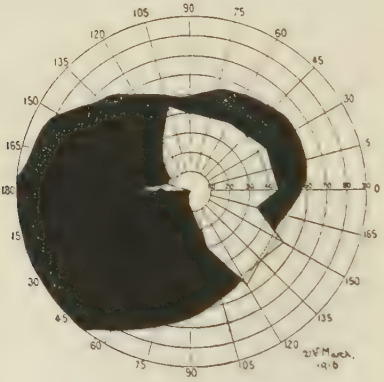


Fig. 45. Visual Field of the Left Eye March 21st.

which enter the left optic tract. The macular or central visual fibers from the macula lutea of each eye are distributed in both optic tracts. As the chiasma is approached the fibers from the nasal halves of the retinae (temporal halves of the fields) tend to become ventral in position, while those from the temporal halves tend to become dorsal. The macular bundle occupies a central position. The optic tract, emerging from the chiasma behind, contains visual fibers from the whole contralateral half of both visual fields, including the central fixation-point of each eye. It winds backward, around the outer side of the crus cerebri, to the primary optic center in the external geniculate body and anterior corpus quadrigeminum.

In this case the apparent left-sided hemianopia, to-

gether with the hemiopic pupillary reaction, seemed at first sight to point to an ordinary straightforward lesion of the right optic tract. More careful study, however, showed that this was not the case. The boundary between the blind and the seeing area of the visual field is not vertical, as in an ordinary tract lesion, but oblique. That is to say, both lateral halves of the visual field are affected, including nearly the whole of the left field

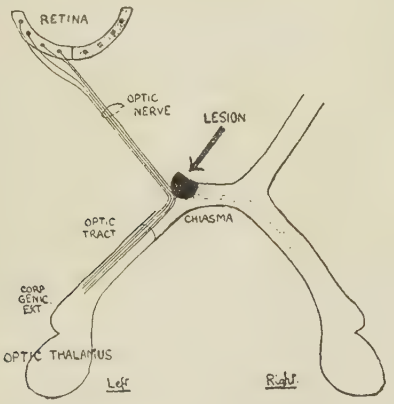


Fig. 46. Diagram Indicating the Position of the Lesion in the Optic Chiasma.

and a small sector of the right. The incompleteness of the affection of the left field is further evidenced by the fact that there is also a small area of recovery extending outward from the fixation-point.

The diagram, Figure 46, indicates the position of the lesion in this case. The lesion affects mainly the fibers destined for the *right* optic tract. Some of them, however, have escaped—viz., those corresponding to the upper and mesial sector of the blind field—also a smaller number corresponding to the area just above the horizontal plane, directly outward from the fixation-point. These latter fibers, from their central position in nerve and chiasma, would be well protected from injury. In

addition, a number of fibers destined for the *left* optic tract are also implicated—*viz.*, those corresponding to the lower and mesial sector of the right half of the visual field.

The Military Value of the Aphakic Eye. Valude[6] makes much of the *responsibility of the State to look after soldiers who have serious eye injuries*, which, he maintains, could not be altered by operation or non-operation. The State has a right to exact from a wounded man such service as he is still capable of giving. Aubineau expresses his views thus: First, an eye affected with cataract involves exclusion from armed service and permits only auxiliary service; second, an eye successfully operated on for cataract does not bring with it exclusion from the service; third, a successful cataract operation does not do away with the responsibility of the State, but reduces the responsibility, since it reduces the loss suffered by the man; fourth, the inopportuneness of a cataract operation in a soldier depends upon the general principles of lens surgery—absolute integrity of the deep membranes of the eye, disappearance of all infectious symptoms and all ocular reaction. Do not operate but in an operable eye, and do not hurry operation—these are the only rules, he says, which ought to guide the surgeon.

OCULAR THERAPEUTICS.

The Economical Use of Solutions of Costly Alkaloids for Ophthalmic Purposes. Solutions of cocaine and homatropine are sufficiently costly at any time to render a method for their better preservation and economical use worthy of note. At the present time their cost is such that economy is more than desirable—it is a necessity.

For the past four years N. B. Harman[7] has used, both in private and hospital practice, solutions of the various alkaloids required for eye work made up with minute quantities of antiseptic drugs, which in combination

(6) Abstract by W. C. Souter in the *Ophthalmic Review*, from Ann. d'Oculistique, February, 1916.
(7) Brit. Med. Jour., Aug. 5, 1916.

appear to have a more satisfactory effect in the preservation of the solutions than others in common use; these small quantities of drugs can be added to the solutions of the alkaloids without objectionable effect. The drugs are well known, easily obtained, and in the quantities used negligible so far as cost is concerned. A stock bottle of "ophthalmic solvent" is kept in the hospital dispensary, and as solutions of cocaine, etc., are required the stock bottle of solvent is drawn upon instead of the bottle of distilled water. The solvent is made up as follows:

Distilled water	1 pint
Methyl salicylate	2 grains
Oil of gaultheria	2 minims
Tincture of iodine	2 minims

The mixture is well shaken, poured into a stoppered bottle, and left for forty-eight hours, when it is ready for use. Different quantities of the drugs have been tried; the above proportions are those which are sufficient for preserving the solutions from contamination without producing objectionable effects in the use of the solutions.

Massive Subconjunctival Injections of Cyanide of Mercury in Dangerously Injured or Infected Eyes. It is not any particular chemical subconjunctival injection that is of importance, E. L. Jones[8] believes, but the process of exciting a maximum normal physiologic action enables Nature to accomplish the resistance of disease or injury, which she could not accomplish unaided, that forms the rationale of this remedy. The formula which has been mostly used for injection is 2 c.c. of 1-1500 cyanide of mercury, in which is dissolved about one-eighth grain each of acoin, morphine sulphate, dionin, boric acid and a little salt. The eye should be cocainized very thoroughly for a longer time than usual in operations, and then the injection will cause pain very seldom lasting over fifteen minutes in an eye previously not painful. If conditions already painful, as iritis or iridocyclitis, exist, ¼ grain of morphine may be used. Children are given as large injec-

(8) Ann. Ophthal., April, 1916.

tions as adults. The lymph channels are flushed by the increased lymph flow, and the nutrition of various structures is increased. In penetrating wounds of the globe and peripheral ulcers of the cornea, the swollen conjunctiva also covers the wounds, and protects against external contaminations and conjunctival secretions. The swelling of the conjunctiva usually leaves the center of the cornea exposed, but in some cases that also is covered. If a central corneal ulcer exists, an immediate injection is advised to check it at once. The injection should be made within a few hours after a penetrating wound, or it will be too late to prevent degenerative changes in the vitreous. After all operations for the removal of foreign bodies from the vitreous, an injection can be made to safeguard the eye from infection.

NEW INSTRUMENTS.

A Corneal Spatula. The instrument is intended, as pointed out by the inventor, C. H. Usher,[9] for cases of foreign body that lie so deeply embedded in the cornea that there is risk during their extraction of pushing them into the anterior chamber unless some form of guard or support is placed against the posterior surface of the cornea. For this purpose a keratome or broad needle is commonly recommended, and presumably has in general proved satisfactory. The presence in the anterior chamber of a flat blade with sharp point and edges, as that of a keratome, during the extraction of the foreign body has, however, some disadvantages and even dangers. On one occasion, during an attempt, in this manner, to remove from the cornea a deep-lying foreign body, the little particle dropped on to the keratome in the anterior chamber and gradually slid off the blade on to the lens. The cause of such an accident may be explained by the concavity of the posterior surface of the cornea preventing the flat keratome blade coming in contact with Descemet's membrane behind the site of the foreign body, so that a space is left

(9) Ophthal. Review, January, 1916.

between the blade and the cornea. If this be the correct explanation the anterior surface of the supporting blade should be made convex.

The spatula consists of a blade, a neck and a handle. The blade is circular with a diameter of 6 mm., its anterior surface is convex with a curvature corresponding to that of the posterior surface of the cornea, which with a radius of curvature of 6.8 mm., gives a maximum thickness to the blade of nearly 1 mm., its posterior surface is flat, its edge blunt and smooth. The neck, 2 mm. in length, is added so that without increasing the diameter of the blade, the instrument can be used for foreign bodies at the center of the cornea. The handle set at an angle of 125° with the neck and blade, allows the blade to be conveniently introduced at the nasal edge of the cornea when necessary.

Usher has used the instrument so far in only two cases. In each the blade was readily introduced through an incision made with an ordinary keratome at the corneal margin. There was no difficulty or complication with either case, the foreign bodies being removed with a Beer's knife. In the second case the foreign body, which had been difficult to see, became well-defined against the light metal behind the cornea. For light-colored bodies a dark blade has been substituted and should be of advantage. Possibly a smaller blade would serve as well, but would require a longer neck when used at the center of the cornea.

The advantages claimed for the instrument are that it is more likely to prevent a foreign body entering the anterior chamber during the manipulations for its extraction from the cornea and, as the blade is blunt, it is less liable to cause damage, especially when aqueous has escaped, during any movement of the eye in a restless patient, than a blade with a sharp point and edges, thus giving the operator more freedom to concentrate his attention on the actual removal of the foreign body. The instrument is obviously not suited for the removal of foreign bodies projecting into the anterior chamber.

An Electric Color Finder. Although he is not an advocate of electrically illuminated test objects in preference to the ordinary methods now used in mapping

out the visual field and the blind spot, Phinizy Calhoun[1] believes such devices have their field of usefulness and can often be employed to advantage, for example, in office or dispensary work on dark days or in the evenings, and bedside examinations in poorly illuminated rooms or wards. To meet such requirements he devised, and used for nearly two years, an illuminated color finder patterned after the very excellent and well-known instrument of Clifford Walker.

Fig. 47. Electric Color Finder.

The instrument is about 10 inches long, and the head contains four perfect colors (white, blue, red and green) made in thin paper and protected by layers of glass, arranged on a slide which is controlled by a thumb guide placed out of the way near the handle. The thumb guide brings into view any one of the colored disks, which is illuminated by a miniature frosted lamp placed behind the color slide and supplied by a hand battery (or a rheostat attachment). There is an additional slide which fits on the face of the instrument and contains a 1, 2 or 3 mm. opening. The entire exterior is painted dull black and appears neat (Fig. 47).

Lachrymal Sac Retractor. Finding the

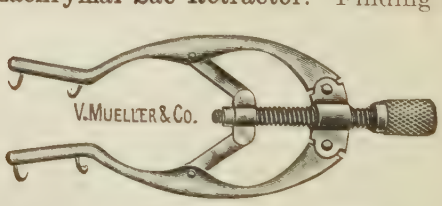


Fig. 48. Lachrymal Sac Retractor.

retractors in use too cumbersome, and with a desire to have a much smaller and lighter instrument, Glen Campbell[2] has devised a modification of Wilder's for opening a scleral wound. Figure 48 shows the instru-

(1) Jour. Amer. Med. Ass'n., May 20, 1916.
(2) Ophthal. Record, March, 1916.

ment, of natural size, the side pieces being extended a few millimeters and two pairs of claws attached. It weighs only 56½ grains. V. Mueller & Co., of Chicago, have made the mechanism for opening and closing the branches in a simpler manner than is used in the Wilder instrument.

A New Eye Speculum. W. H. Wilder[3] has had the *ordinary eye speculum modified for cataract operation.* To the under surface of the arms of the speculum are attached the ends of two rather firm bars, the other ends of which are fastened to a small plate that serves as a handle. These attachments are all jointed so that they do not interfere with the ready opening or closing of the instrument. The purpose of the contrivance is to furnish a small firm handle, by means of which the assistant can at all times until the termination of the extraction easily and firmly lift the speculum away from the eyeball, and yet have his hand away from the arms of the instrument should the operator suddenly be required to remove it. One may thus more readily guard against a sudden closure of the lids that might result in loss of vitreous.

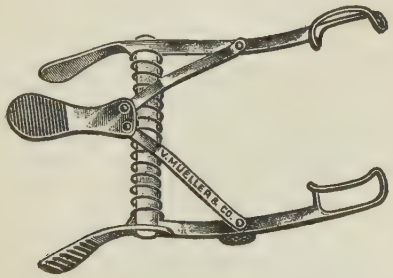


Fig. 49. Wilder's Cataract Speculum.

The bars that form the handle are not so stiff that they cannot be slightly bent if desired, to conform to the shape of the face of the patient. Such a handle could be attached to almost any model of speculum, but as shown in Figure 49, V. Mueller & Co. have applied it to the preferred model.

(3) Ophthal. Record, July, 1916.

A Simplified Tonometer. A new type of tonometer for taking direct readings of the intra-ocular pressure in glaucomatous eyes has been devised by Souter.[4] This instrument is extremely simple in construction and method of application, giving direct readings, which are taken with the patient in upright position and thus a diagnosis can be rapidly made. It contains fewer parts, is smaller and more portable, as well as less expensive, than other tonometers which are now in use, and it is therefore claimed by the inventor that on account of these facts this tonometer is especially well adapted for clinical and hospital use. The instrument is about the size and weight of a fountain pen, and may be carried in the vest pocket. It is constructed entirely of metal, and consists of a light tubular body, with side finger grips and open scale, and has also internal end caps, which support a resiliently balanced sound with piston index (Fig. 50).

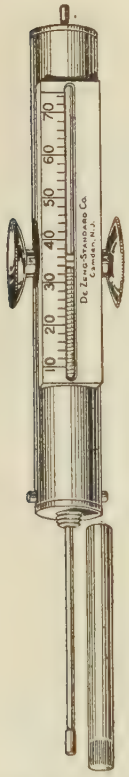


Fig. 50. Souter's Direct Registering Tonometer.

A stop or break is provided near the forward end of the casing on either side for temporarily retaining sound in diagnostic position for reading. The counter-poise construction is exact, and includes antifriction bearings for the sound and a compensating precision spring, which is made of uniformly drawn phosphor-bronze wire. As the elastic limit of the spring greatly exceeds the requirements, the reliability of the instrument should remain unimpaired irrespective of time or use. The scale calibrations are accurately cut into the metal, and represent pressure in millimeters of mercury. The instrument is well finished in black nickel, the scale contrasting clearly in white. The contact portion of the sound may be sterilized in

(4) Interstate Med. Jour., October, 1916.

the usual manner without injury. Complete directions of technique are furnished with the instruments by the manufacturers.

A New Anterior Capsule Forceps. This instrument (Figs. 51 and 52) was devised by D. T. Vail[5] to secure all or the greater part of the anterior capsule of the

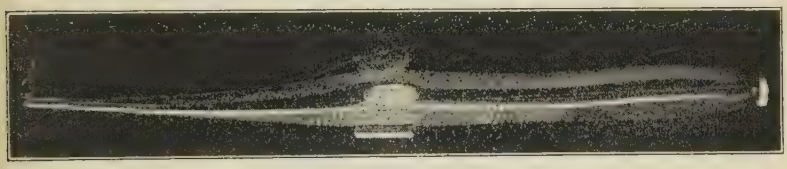


Fig. 51. The Instrument (Reduced) with Blades Open.

lens in those cases in which, for any reason, it was found that the ligaments refused to separate in the attempt at delivery of the cataract in its capsule.

If the cataract will deliver in its capsule without threatening loss of vitreous, the writer does not use capsule forceps, but if the lens shows a stubborn dis-

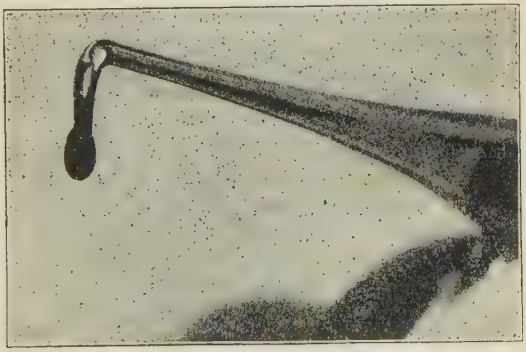


Fig. 52. The Branches of the Forceps (Magnified) Blades Closed. Anterior Capsule Forceps.

position or if the ocular state as to tension, chorioidal disease, etc., is prejudicial to a smooth operation by the intracapsular method, he has found this instrument of extreme value.

(5) Ophthal. Record, October, 1916.

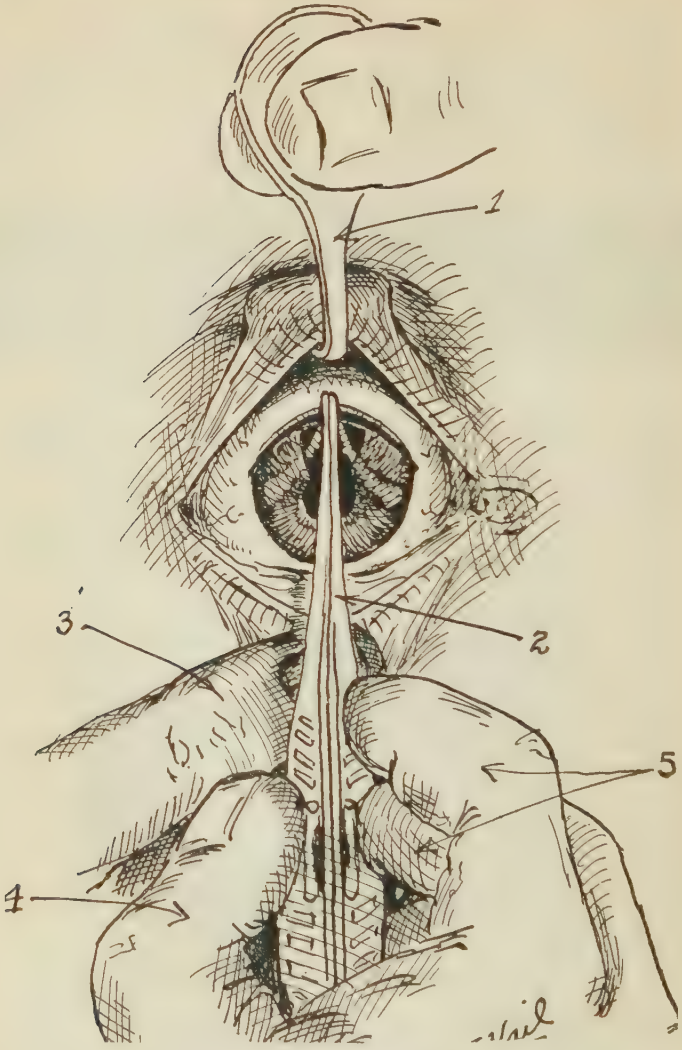


Fig. 53. The Method of Using the Anterior Capsule Forceps. (1) The Author's Upper Lid Retractor. (2) The Author's Anterior Capsule Forceps in situ behind the Iris. (3) Forefinger of Operator's Left Hand controlling the Lower Eyelid. (4) and (5) Thumb and Fingers of the Operator's Right Hand Grasping the Instrument like a Scalpel.

The following points are claimed:

(*a*) The spatula-like, disc-shaped end will pass behind the iris to the periphery of the lens with surprising ease. (An iridectomy is necessary.)

(*b*) On opening the blades they flare a little, so that the teeth will engage the live capsule at once, and on closing the blades the teeth resume a smooth plane.

(*c*) The construction of bevels on the blades is such that it is impossible to pinch the iris at any point.

The accompanying illustration is designed to show that the deWecker principle is employed; the end is turned at such an angle as will permit its use without shifting the control of the upper lid; thus, in case of a resisting lens, it is but the work of a moment to tear off the anterior capsule with this instrument and then go on with the delivery.

Vail cautions against "digging" backward to get a grip. Simply pass the tip between the iris and lens, open the blades to the limit, adapt the blades to the plane of the capsule, close them slowly and then gently or coaxingly strip off the capsule. The removed portion is then floated in 1 per cent. phenol solution, teased out on a slide, stained and preserved for demonstration.

He has used this forceps in over fifty ominous cases and has converted them all into smooth operations without loss of vitreous. Immature and nuclear cataracts yield their anterior capsules with no operative complications and with surprisingly good final results.

Photography of Eye Specimens. R. H. Elliot[6] has developed the following method of photographing prepared eye specimens which may be of value to the investigator. Elliot regards the following points of importance: The photograph must be taken in water, without the intervention of glass or other similar material. The source of light must be good and even. The camera must be placed vertically above the object so as to avoid reflections. The object of the photograph must be placed so that its image will occupy the center of the plate, and a method of adjustment should be available to secure this end with a minimum of inconvenience. A simple arrangement is necessary to fix the

(6) Lancet, Nov. 11, 1916.

eye in position during the whole period of exposure. To save unnecessary retouching the object should be photographed lying on a dark and uniform surface to obviate the background disturbing the attention of those viewing the picture. Care should be exercised in the choice of a camera and exposure periods must be carefully studied. For the making of lantern-slides the contact method is recommended, and attention is directed to the following points: correct exposure; the preparation of plates for exposure; development and fixation of the slides; the drying of the plates; and the reduction, intensification and varnishing of slides.

COMPARATIVE OPHTHALMOLOGY.*

The Elements of Comparative Ophthalmology. T. M. Stewart gives in abstract the chief, familiar facts connected with the gross *Anatomy and physiology of the non-human eye.* The article will be found interesting and instructive, to one desiring to acquaint himself with some of the rudiments of comparative ophthalmology.

[Those who would like to expand their knowledge of this fascinating and interesting subject are referred to the section on Comparative Ophthalmology, pp. 2519 to 2762, Vol. IV, of the *American Encyclopedia of Ophthalmology.*—Ed.]

The Cornea of Snakes and Eels. A. Rochon-Duvigneaud refers to the well-known fact that *snakes shed an external layer of the cornea* with an annual renewal of the body integument, and that the transparent filament so discarded resembles closely a watch glass set in the surrounding skin.

It may be said that the transparency and other normal qualities of the vertebrate cornea are variously protected; 1, by movable eyelids (including the third eyelid or nictitating membrane of birds, and some reptiles); 2, by eyelashes and eyebrows. An examination of the outer covering of the cornea of numbers of snakes

(*) [Most of the matter in this chapter has been contributed by the Editor to the *Ophthalmic Year-Book.* We are indebted to Dr. Jackson for permission to reprint it here.—Ed.]

made by the author shows it to be insensible and that it exhibits all the characters found in the scales of the reptile or in the finger nails of the higher mammals.

The ophidian cornea is not kept clean either by lachrymal secretion or by the winking action of eyelids, so that some other means must be adopted to preserve its transparency. This need is all the more urgent because the cornea of the snake is more exposed to injury than it is in the majority of animals by reason of the habit of crawling and darting along the ground. The head is thus constantly liable to come in contact with thorns, twigs, stones, etc., and the cornea to be scratched and otherwise injured by these objects.

Worm-like fishes that make their way along the beds of the sea, lakes, rivers and other bodies of water—the common river eel, conger eel, the lamprey, etc.—are also more liable to this form of injury than fish whose habitat is clear water. They consequently have "eyes under their skin" although their corneae are not regularly renewed as in the ophidia.

Microscopic examination of the snake's cornea in a large number of instances demonstrates the presence of a transparent horny covering over the true cornea that permits a certain movement of the latter beneath it. This is the scale-like covering shed every summer by the snake. It appears to be laid upon but does not form an integral part of the corneal tissues; it is not, indeed, a true layer of the cornea but is continuous with the epithelial covering of the rudimentary lids of the animal. The author speaks of it as a complete, fixed, transparent protective cuirass beneath which is the free-lying, detached, mobile eyeball. The article is well illustrated.

The Eye-Spots (Ocelli) of Salmincola. Nathan Fasten[7] gives an account of the ocelli in the invertebrate free-living larvae of *Salmincola edwardsii (Lernaeopodia edwardsii)* Olsson, a parasitic copepod of the family *Lernaeopodidae.* They infest the common brook-trout, *Salvelinus fontinalis* and give rise to what is known as "brook-trout disease." Each ocellus is observed to consist of a definite number of cells, the so-called retinal

(7) Biolol. Bull., p. 407, December, 1916.

cells, there being nine in either of the lateral ocelli, and five in the median one.

Within every retinal cell, there is a prominent nucleus, more or less spherical in appearance, which is made up of a network, consisting of fine chromatic strands with thickened clumps of chromatin. At the base of the cell, that portion nearest the basal plate of the ocellus, there is a rod-like, heavily staining structure surrounded by a clear space. This is the phaosome and in all probability it functions in the transmission of visual stimuli to the nerves of the retinal cells.

The nerves of the retinal cells make their way posteriorly, from the surfaces of the semilunar cups. These nerves are very thin, fine strands which can not be counted with even the highest powers of the microscope. But assuming that each retinal cell is connected with one nerve, there must be nine retinal nerves to each lateral ocellus, and five of them to the median ocellus, making altogether twenty-three nerves. Slightly back of the ocelli, these nerves combine into an optic nerve and this then enters the brain of the larval organism.

Fasten finds as the result of his histologic investigations of the subject that the eye of *Salmincola edwardsii* Olsson is located medially, in the space between the brain and the dorsal wall of the body. Unlike the eye of *Achtheres ambloplitis* Kellicott, another one of the *Lernaeopodidae* described by Wilson, the visual organ of *Salmincola edwardsii* is normally developed and functions during the first copepodid or the free-swimming larval stage of the parasitic organism. The eye is more or less of a reddish-brown, *x*-shaped pigment blotch, consisting of three ocelli. Two ocelli are located laterally, while the third is below these, occupying a median position. In size, the median ocellus is about two-thirds the dimensions of either of the lateral ones. Each ocellus is constructed somewhat similarly. It is embedded in a semi-lunar cup whose internal surface is thickened into a basal plate. Covering the external face of the ocellus is a cuticle which is divided up into squares that appear like the facets of ommatidia. Interiorly every ocellus contains numerous retinal cells. There

are nine of these cells in each lateral ocellus and five of them in the median ocellus. The retinal cell possesses a large, rounded nucleus and a single rod-like, heavily staining phaosome, which is located between the nucleus and the basal plate. The optic nerve which makes its way from the ocelli to the brain consists, in all probability, of twenty-three nerves corresponding to the number of retinal cells found in the eye.

The Retina of the Whale. G. Ten Doessdhase has discovered in the *anterior layers of the retina of the embryo of the whale* a histologic arrangement that recalls the hydrostatic organ described by Pütter in certain aquatic mammals.

The Light Sense of the Larvae of the Blow Fly. H. Weve[8] concludes, after numerous anatomical and physiologic studies of the full grown maggot, *Calliphora erythrocephala,* that the light sense curve shows great similarity with the curve of light sensibility of the dark-adapted or color-blind man, measured by the sensation of luminosity. It corresponds with the curves of all the invertebrate animals examined by Hess.

Illumination decreases the sensitiveness to successive weaker light stimuli, or even removes it. After being kept a few minutes in the dark, or in a weak light, the sensitiveness returns, so that one may say that in these animals both light and dark adaptation exist.

The anterior head segment exhibits two pairs of sense-organs. Probably the dorsal organ is the one sensitive to light; the other is an olfactory organ. Immediately after removal of these organs sensitiveness to light can not be demonstrated, but it returns after some hours, or, it may be, days. This return of visual sensation may, however, be explained by the presence of a number of smaller sight organs in the head segment, placed near the larger ones.

In the footnote Weve mentions W. F. Ewald's recent investigations, which make a two-color system probable for *Daphnia pulex.* We should be careful in accepting the dictum of Hess that invertebrate animals are totally color blind.

(8) Ophthalmology, Vol. 12, p. 429, 1916.

The Nerve Supply of the Iris in Man and Birds. J. Boeke[9] found the relations between the efferent *nerve-endings and the muscle-cells of the pupillae sphincter in the iris of the human eye* essentially the same as in the ciliary muscle. In connection with these observations it seemed to be of interest to study somewhat more closely the structure and innervation of the intrinsic muscles of the bird's eye. As is well known, the ciliary muscle and constrictor iridis of the avian eye are composed of striated muscle-fibers; the iris dilator, however, does not show any vestige of striation.

In the iris of the bird the muscle fibers are branched, interwoven, and anastomose through their side-branches, so that there is a continuity of the fibers throughout the whole ring of the iris instead of a tissue containing only distinct separate fibers. The muscular system of the iris can be regarded as a coherent whole composed of elements connected with each other, in which the fibers of the circular system are in organic connection with the radiating fibers of the iris musculature. Entirely independent of the system is the membrane of Bruch, composed of fibers (or elongated cells) running only in a radial direction and remaining through life in close connection with the epithelium of the iris and constituting the real dilator pupillae.

In the iris stroma nerve-fibers running between the muscular element of the sphincter pupillae are found, which supply them with terminations. On the muscle-fibers both of ciliary muscle and of the sphincter of the pupil these efferent nerve-terminations are loose and provided only with a few branches and small end rings or delicate end nets. The motor nerve-fiber usually enters the muscle fiber at a sarcoplastic protuberance. A periterminal network in the sarcoplasm and the intimate connections between this periterminal network and the nerve-termination on one hand and the contractile fibrils on the other hand could be stated with accuracy. In addition to the motor nerve-endings at the end of the medullated nerve-fibers there exist in the sphincter pupillae and ciliary muscle of the bird's

(9) Nederl. Tijdschr. v. Geneesk., abstracted in *Ophthalmology*, p. 698, 1916.

eye, just as in the skeletal muscles, delicate, non-medullated nerve-fibers with their small, loosely arranged endings, that enter the muscle-fibers independently of the motor terminations, and which can be traced to the sympathetic.

Ganglion cells in the corpus ciliare and iris are rare. It seems improbable, therefore, that they should exist in the numbers required to substantiate the theory of Inglis Pollock.

The Origin of Black-Eyed White and Pink-Eyed Albino Mice. J. A. Detlefsen,[9] in an article which should be read in full, says that of the many domesticated varieties of the house mouse *(Mus musculus),* two sorts with entirely white pelage are known—the albino, and the black-eyed white. Numerous experiments have shown that the albino differs from colored varieties by the loss of a single factor, the color factor; for, in crosses with colored varieties, albinism acts as a recessive allelomorph. The genetic composition of the black-eyed whites is less well known, although several hypotheses have been suggested. Black-eyed whites possess the color factor as crosses with albinos have shown. They may be homozygous in the factor for dark eyes. A black-eyed white male produced 189 dark-eyed offspring in experiments when mated to pink-eyed intense brown females. The offspring of this cross were heterozygous in dark eye. By mating them *inter se,* pink-eyed forms were finally obtained, some of which had a pure white coat. In other words, it is possible to recombine the factors producing the pure white pelage of the black-eyed whites with the pink-eyed condition. Such pink-eyed whites resemble true albinos in appearance, but not in zygotic constitution, for they still retain the color factor although they show no color. The author believes that colored offspring will arise from a cross between the pink-eyed white and the albino, although externally the mating resembles a cross between albinos which always breed true. Black-eyed white strains sometimes show a few colored hairs around the ears, between the eyes, and in front of the tail. The corresponding pink-eyed white forms may also show the same characteristic.

(9) Amer. Naturalist, Vol. 50, p. 46, 1916.

The white coat and pink eyes of the albino mouse are due to the loss of a single factor; but the white coat of the black-eyed white strains can not be accounted for in such a simple manner. Little seemed inclined to the view that the black-eyed white mouse was a spotted individual in which the spotting was of the recessive type, in contradistinction to spotting of the dominant type described by Miss Durham.

Growth of the Eyeball and Inanition. Chester A. Stewart[1] remarks that numerous observations are recorded in the literature on the recovery of the body weight as a whole in different animals upon refeeding after various periods of growth suppression; but very few observations have been made upon the individual organs and parts. He accordingly submitted eight litters of albino rats to this form of experimentation for a prolonged period and found that, as compared with Donaldson's norm, the eyeballs were excessively heavy (plus 42.8 and 45.5 per cent.) in the two rats killed at the end of nine weeks of maintenance. The persistent growth of the eyeballs in young rats held at constant body-weight was discovered by Jackson. In the rats refed one-half, one, and two weeks the eyeballs are still relatively heavy as compared with Donaldson's norm, although the difference has decreased somewhat during these periods. Even in the rats refed four weeks the eyeballs are still somewhat above Donaldson's norm, but are practically normal as compared with Stewart's controls.

Likewise in the adult refed rats, as compared with the controls, the eyeballs appear to be normal in weight, although in the females they somewhat exceed the Wistar norm in weight.

The evidence therefore indicates that the eyeballs, which were relatively heavy at the end of the maintenance period, returned to the normal proportion by the end of the fourth week of refeeding, and were normal in the adult test rats.

(1) Biolog. Bull., p. 39, July, 1916.

THE EAR.

ALBERT H. ANDREWS, M.D.

Translations from French and German by
Samuel Salinger, M.D.

DISEASES OF THE EAR.

Care of School Children With Ear Affections. Laube[1] emphasizes the necessity of examining all school children for ear troubles in their own interest as well as that of the other children and the teachers; first to prevent the spread of tuberculosis, influenza, and other infections and second to avoid having the teacher give up too much time to those who are hard of hearing and at the same time straining his own voice. It is important to discover unilateral affections and mild degrees of deafness early so that they may receive prompt attention, and it is also vital to identify those who are very deaf. The principal fact to be elicited is whether the child can hear more than 8 m. whisp. sp. in one or both ears. Assuming the normal to be 25 m. if the hearing is diminished to one-third we can be sure that there is some pathologic condition present. The nose and throat should be examined, the drums inspected and the hearing tested before and after inflation. The author's records for twenty-one years show that 10 per cent. of all school children have had some ear affection. Other observers have noted larger percentages. Nager of Lucerne found 40 per cent., Bezold 25 per cent., Ostman 28 per cent., and Denker 23 per cent. The reason Laube's percentage is so much smaller is because the mild cases were not included in his records on account of the great expense of making exact tests in so many examinations. The principal affections found were, tubal disease 63 per cent., remains of middle-ear infections 16 per cent., inner ear disease 8 per cent, cerumen 6 per cent., chronic catarrh 3 per cent., chronic suppuration 2 per cent., acute infections 1.3 per cent.

The children's parents are given cards stating where

(1) Cor.-Bl. f. Schweiz. Aertze, Dec. 16, 1916.

and at what hours the children may be taken for clinical treatment. For those who are hard of hearing the following measures are used: they are placed in seats close to the front with their best ear turned toward the teacher; second, the curved hand or ear trumpets are used; third, there are special classes for the partially deaf with instruction in lip reading; fourth, the patient is placed next to a "protector," that is another child whose hearing is normal who prompts and supplies information the other may have failed to hear. Hearing apparatus is given only to those who can not hear their own voice. Lip-reading according to Gutzman's method is very important. Special schools are for such as can not hear whisp. sp. up to 2 m. Special teachers from deaf and dumb institutes are very necessary but are not so available in Switzerland as in Germany.

Acute Inflammation of the External Auditory Canal in East Africa. In recent years, according to Grothusen,[2] there has been an increase in the number of cases of inflammation of the external auditory canal extending to the auricle occurring in the vicinity of the coast (Kilwa) during the rainy season which are particularly attended by severe pains that prevent sleep and generally last for from 10 to 14 days. The treatment giving the best results consists of moist dressings of aluminum acetate, 1 per cent., applied twice daily and a gauze strip soaked in the same solution within the canal: Aspirin is also given internally.

Pulmonary Gangrene of Otitic Origin. Rist and Roland[3] report the case of a soldier who had had a chronic suppurative otitis media, and was brought in with high fever, thoracic pain, dyspnea, and herpes labialis. Central pneumonia was suspected. After a few days dullness was found at the base of the left lung and the expectoration became putrid. The patient died. Autopsy revealed a number of disseminated embolic foci in various stages of gangrenous degeneration. Some had already broken down leaving cavities. At one spot there was a purulent pleuritis. The origin of this infection was found in the ear which showed a

(2) Deutsch. med. Wochenschr., April 13, 1916.
(3) Presse méd., April 3, 1916.

chronic suppurative otitis media with cholesteatomata, breaking down of the mastoid with obliteration of all cells, an obliterating phlebitis of the sinus and internal jugular. The meninges were not affected.

Pulmonary complications of ear diseases although frequent in children are uncommon in adult life. They occur in cases in which the infection is due to anaërobic bacteria.

Prognosis of War Deafness. Lannois and Chavanne[4] state that the prognosis in these cases depends on:

1. The prior condition of the auditory apparatus: Individuals having had a chronic suppurative otitis media or an adhesive process give a worse prognosis than healthy persons following shock to the labyrinth from bursting shells. Out of 189 soldiers returned from the front having a relighted suppurative otitis media only 43 per cent. were able to return to active service; 56 per cent. were put into the reserve, and 1 per cent. discharged. Of 134 soldiers having an adhesive process and returned from the front because of insufficient hearing 52 per cent. were able to return to active service and 48 per cent. were put into the reserve.

2. The presence or absence of cranial trauma: Deafness is the rule following trauma to the mastoid itself (95 per cent). It frequently follows injury to the facial canal (from 30 to 40 per cent) and rarely accompanies fracture of the vault. These cases are generally unilateral. In the absence of direct trauma shock to the labyrinth rarely causes deafness. In 645 cases of labyrinthine shock with or without rupture of the drumhead 2 per cent. resulted in permanent bilateral deafness. Rupture of the drum seems to act as a decompression agent and lowers the proportion of deafness because in 262 cases in which the drum was intact 5 per cent resulted in bilateral deafness. Acoustic exercises are of no use in complete deafness following labyrinthine shock; recourse must be had to lessons in lip-reading in order to conserve the social effectiveness of those who have lost their hearing through trauma.

In the prognosis of war deafness it was necessary to

(4) Lyon méd., June, 1916.

exclude simulation which was found in 11 per cent. of 262 cases of pure labyrinthine shock.

The sooner the deaf and deafmutes whose condition is of traumatic origin fall into competent hands, the sooner they will be benefited.

Deafness from Gas Poisoning. This case is reported by W. L. Simpson.[5] The patient was a man of 21 who had been overcome by gas and who was unconscious three days. On regaining consciousness, he found that his hearing was very bad. The hearing had improved somewhat before presenting himself at Simpson's office.

Hearing for conversation was 10 feet, both ears, and whisper 1 foot, both ears. Rinne plus; Schwabach, shortened; C′ plus and C plus. Tinnitus was present in both ears. The vestibular tests were normal. The drums in both ears were normal; the Eustachian tubes were patent. Strychnine nitrate internally and sweats were prescribed and within three months the hearing was almost normal. Whisper eighteen feet, both ears.

Deafness and Heredity. This subject is discussed by H. Burger,[6] who asserts that it is a mistake to diagnose otosclerosis merely on the basis of inherited deafness. The deafness is liable to be of quite another type, the trouble being in the sound-perceiving rather than in the sound-conducting apparatus. In the labyrinth type, deafness comes on about the age of 30 or 38 and slowly progresses to the age of 50, when it grows rapidly more complete. The perception of high and low sounds, and bone and air conduction of sounds also differ from those with otosclerosis. Burger presents charts of three generations of a family showing twenty-nine members more or less hard of hearing or totally deaf out of a total of eighty-seven members, not including three deaf in a previous generation. He examined five of the deaf members of the family and found in two the progressive internal ear type of deafness; in another, premature senile deafness; and in two others the otosclerotic type of deafness. It seems probable, he thinks, that in this family the organ of hearing is physiologically inferior and yields too readily to morbid influences of various

(5) Jour. Ophthal. and Oto-Laryngol., July, 1916.
(6) Nederl. Tijdschr. v. Geneesk., April 29, 1916.

kinds. This predisposition is inherited and may never encounter anything to rouse it to an active process; if this does occur, however, the active process may be of different types in different members of the family with the inherited taint. This assumption explains also, he says, congenital deafmutism, and he protests against the usual classification of this condition into the congenital and acquired types. A deaf child who has never spoken is regarded as a congenital deafmute, and the possibility of deafmutism as the result of a brain or meningeal inflammatory process in early infancy is quite overlooked.

Burger is inclined to agree with Hammerschlag's dictum that the difference between deafmutism and progressive labyrinth deafness is one of degree only. The anatomic basis for each is strikingly similar. The fact that the labyrinth deafness does not develop until late in life is no sign that the sound-perceiving apparatus is not constitutionally inferior. Other arguments in favor of this assumption are the remains of hearing in certain deafmutes, and the cases of congenital partial deafness—this is always of the labyrinth deafness type, and in his cases of this kind the deafness displayed no progressive tendency. A still further argument is the labyrinth deafness which develops in the young and grows rapidly worse between the ages of 15 and 20.

Other facts which he cites in evidence are that Kuiper found atrophy of the stria vascularis cochleae in the internal ear of Japanese dancing mice, and Mayer found the same in persons with otosclerosis, while this has long been known to occur in deafmutes. On the other hand, Politzer reported some years ago finding foci of new bone growth—spongiosa—in the labyrinth of deafmutes. Koerner advised persons with otosclerosis to refrain from marrying, so as to carry their otosclerosis in the grave with them. But Burger says that this prohibition, to be effectual, should extend also to the brothers and sisters of persons with otosclerosis, as they may have inherited the same tendency and be liable to transmit it, although this "determinant" has remained latent in them. "In fact," he says, "think of the latent dangerous determinants any one of us may

be carrying around! At the twelfth generation each of us has 4,096 ancestors!"

Otitis Externa.* The following description presents the picture of the otitis externa in the cartilaginous region as given by Max Lubman:[7]

The patient complains of a sudden pain in the ear which is constantly aggravated at night and prevents sleep. Upon examination one finds an accelerated pulse, a rise of temperature and a coated tongue. The patient looks ill and depressed. Upon inspection one finds more or less swelling behind the ear, as well as in front of the tragus, which is very tender to the touch. The post-auricular fold has disappeared and the auricle is pushed forward. An examination with a speculum, a very painful proceeding to the patient, discloses a swollen and edematous canal, and the drum obstructed by the swelling.

In such a case, the question naturally arises: Is it a case of an acute otitis media in a severe form where the infection has broken through the cortex and produced a subperiosteal abscess—the swelling in front of the tragus indicating an involvement of the zygomatic cells, requiring an immediate operation—or is it a case of otitis externa making an operation unnecessary? It is necessary, therefore, to point out and tabulate concisely the cardinal symptoms of an otitis externa and of an otitis media respectively, and thereby assist in making a differential diagnosis.

OTITIS EXTERNA.	OTITIS MEDIA WITH MASTOID INVOLVEMENT.
1. Quite rare in children.	Very common in children.
2. Due to mechanical irritation, as cleaning the ear with a hairpin or a match, and infection caused this way.	Mostly secondary from nasal retronasal space, or through involvement of the Eustachian tube.
3. Pain is more or less localized around the ear.	Pain deep in the ear.
4. Temperature 100° to 101°.	Temperature 103° to 105°.
5. Pulling the auricle up and down very painful.	No pain at all.
6. Mastication painful.	Mastication not painful.

(*) See also page 207, this volume.
(7) Med. Times, April, 1916.

7. Superficial pressure on mastoid very painful, deep pressure less painful.	Deep pressure painful, superficial pressure not painful.
8. Swelling in front and back of ear an early symptom.	A late symptom.
9. Swelling of canal is typical.	Canal never swollen, except when secondarily infected.
10. Pressure on the canal in the post-auricular fold will give pain.	No pain.

All these points should be carefully considered in every doubtful case. The symptoms in the one case are invariably the antithesis of the other, and a correct diagnosis should therefore present no insuperable difficulties.

Non-Suppurative Deafness. According to S. E. Roberts,[8] all patients with this symptom should undergo tests for syphilis. He believes that the majority of such cases, especially when paracusis is present, are due to that cause. Patients usually do not complain of paracusis and when questioned will say they had observed that they heard best in a noisy place, but had thought it due to the other person speaking more loudly, and only after a careful test for themselves, were they convinced that they were paracustic.

They complain of a high-pitched tinnitus and autohypercusis; that is, they speak in a low tone and are hard to understand, their own conversational voice sounding very loud to themselves.

The family history usually shows that some other member of the family has impaired hearing, oftener a brother or sister than a parent. Rarely is the physician able to get a history of constitutional disease in the family. The physical findings are not very important. Inspection of the drum in early cases shows nothing characteristic, in fact the drums are very similar to the drums in chronic non-suppurative otitis media. After the disease has existed a number of years the drum becomes relaxed and eventually atrophied.

Functional tests with tuning forks have rather a wide

(8) Jour. Missouri State Med. Ass'n., April, 1916.

variance, depending on the chronicity of the case. The low C with 128 vibrations a second for bone conduction is increased; C-2 fork bone conduction, usually normal, may be slightly decreased; air conduction reduced for all forks, especially low tone.

Voice and acumeter tests are correspondingly reduced as air-fork tests.

Gelle test was negative in six of the author's cases. The patient could appreciate a slight reduction of sound intensity in three, and three tests were doubtful.

The etiology of cases of this class has been found to be syphilitic in from 80 to 85 per cent. and congenital in nearly all. For the other 15 or 20 per cent., if not syphilitic, the author is unable to give a cause, but certainly they can no longer be called catarrhal, the cloak behind which we have all shielded our ignorance for years in bad cases of deafness.

The only possible way catarrhal troubles of the nose, throat and Eustachian tube could influence the condition under discussion would be to superimpose a secondary disease or complication, which could be eliminated by properly directed treatment.

The most important points in the diagnosis to consider are: (1) History of gradual loss of hearing with paracusis and without suppuration; (2) negative or relatively negative Gelle test—by compression of air in external meatus patient is able to note only a slight or no reduction in intensity of sound of tuning fork as conveyed through cranial bones; (3) positive Wassermann and gold chloride tests from spinal fluid.

Dr. Roberts submits every patient to spinal-fluid test for syphilis who has the first two points above mentioned, regardless of the patient's denial, a negative family history, or the absence of other physical finding of syphilis.

Misleading histories of venereal diseases are traditional in medicine and much more so in a congenital condition of which the patient may never have had symptoms distinct enough or education along those lines sufficient to focus his attention on the subject. Roberts says that he places most reliance in the Wassermann and gold chloride from spinal fluid. He has found the blood

Wassermann in a number of these cases to be negative with decidedly positive spinal-fluid tests.

The pathology of this condition, while yet to be worked out, he believes to be a syphilitic periostitis or ostitis in the capsule of the labyrinth. When it begins near the oval window and produces a thickening and infiltration of periosteum there will necessarily result some degree of stapedial fixation. The process, of course, may progress and involve the cochlea, vestibule and semicircular canals, their capsules and contents, and nerve deafness will result.

If the case comes under observation, is diagnosed and properly treated while bone conduction is still increased, the author believes that there is some chance for improvement in hearing. If, however, it has progressed to a stage of shortened bone conduction showing nerve degeneration, the prognosis is unqualifiedly bad for functional improvement.

Mechanical Aids to Hearing. In discussing mechanical aids to hearing, Ralph Butler[9] says they have found little favor as compared with aids to vision, probably because they are less efficacious, convenient and becoming than glasses; also, because the partially deaf are more sensitive in regard to their affliction than the partially blind. Mechanical aids are contra-indicated in cases in which relief can be secured by treatment, or when hearing is fairly good. They are of no value if the auditory nerve or centers are destroyed. Here nothing helps the patient except the sign language or lip reading, perhaps better named expression reading. In many very deaf patients the nerve and centers are normal, the trouble being in the conducting apparatus of the middle ear, and such patients are most likely to be helped by these devices. These appliances are recommended when the patient is very deaf, incurable, and finds that he can get on better with than without them. The only invisible aids to hearing which are of value are the artificial drumheads. They are occasionally of signal benefit, but obviously useless when the drumhead is thickened and stiffened from an old inflammation; and they are contra-indicated in purulent

(9) Jour. Amer. Med. Ass'n., April 15, 1916.

otitis media, or when they cause inflammation or tinnitus. They are most likely to be helpful in the presence of a dry perforation, or a relaxed drumhead. The principal types are the disk made of thin paper, or of rubber, the tiny flattened ball of cotton, or small pieces of rubber tubing. The disk of paper has the advantage that it acts as a splint and stimulates the growth of the epithelium, frequently causing the perforation to close. These disks can not be changed by the patient, unless a handle is attached; and, like all these drumheads, they require observation to guard against irritation which may cause purulent otitis media. The indiscriminate use of the much advertised artificial ear drums or "invisible phones" is to be condemned. The increased intensity produced by the larger volume of sound collected by the conversation tube, ear trumpet and ear dome overcomes the pathologic stiffness of the ossicular chain and enables it to transmit the sounds to the nerve endings. Possibly these instruments also utilize the increased bone conduction of middle-ear deafness.

Relation of Diabetes to Ear Affection. This subject is discussed by C. Zimmerman.[1]

Of all ear affections in diabetes, purulent otitis media has been observed most frequently. According to Koerner's statistics, and a critical analysis of forty-six cases by Eulenstein, partly observed by himself, partly from literature, diabetic persons have a greater tendency to suppurations of the ear and temporal bone than non-diabetics, and acute otitis media in diabetics leads much more frequently to diseases of the bone—to extensive caries and necrosis—than in non-diabetics. Although the formerly held opinions of a specific diabetic otitis has been refuted as erroneous, it is certain that the greater vulnerability of the tissues of the body in diabetes predisposes to the occurrence of acute otitis media and retards the healing process, so that the affection is apt to become chronic.

This predisposition in diabetes is given by the presence of sugar in the blood and tissues, furnishing a very good culture soil for microbes. It is well known

(1) Ann. Otol., Rhinol. and Laryngol., September, 1916.

from experimental bacteriology that animals that are ordinarily proof against certain microbes can be successfully inoculated with these after grape sugar has been introduced into the body and an artificial diabetes produced.

Hence, one must assume that the cells of the tissues must be changed by the sugar, so that they do not offer sufficient resistance to morbid agents. This is further due to lack of nutrition from early arteriosclerosis in diabetes, as first pointed out by Israel.

According to Koerner, adults, especially men, suffering from diabetes, do not easily recover from an acute otitis media without severe, very rapidly spreading mastoiditis. It is characterized by extensive central destruction of bone in the mastoid process, before signs such as tenderness to the touch, or swelling, show on the outer surface. Apparently it commences by hematogenous infection of the bone, extends early to the pneumatic cavities, and discharges its pus on the preformed path through the tympanic cavity, and at first has the aspect of mere suppuration of the middle ear. The mastoid may be converted into a large cavity, filled with granulations and pus, covered by a very thin corticalis, and the operation reveals the inner table of the sigmoid sulcus or the middle cranial fossa destroyed to a large extent.

Every patient submitting to surgical treatment must be carefully examined for diabetes. The unfavorable influence of surgical interference may be caused by the psychic shock and the effects of the traumatism on the nervous system, the deleterious influence of the narcotics on the organs participating in the metabolism of the carbohydrates and the acidosis bodies, loss of blood, disturbances of taking nourishment, respiration and circulation, etc. The consequences may be increase of the intensity of diabetes, as shown by the increase of glycosuria observed after mastoid operations, acidosis, acceleration of general weakness and heart failure.

Furunculosis of External Auditory Canal. Harold Hays[2] insists that there is no more painful condition with which the otologist has to contend than furuncu-

(2) Med. Times, November, 1916.

losis of the ear canal. This does not even except inflammation of the middle ear.

In the majority of instances, furuncles are the result of an infection of a hair follicle, the causative organism in most cases being the *Staphylococcus aureus*. As a rule the cases are not serious, but Hays has known of two patients who developed mastoiditis by a perforation of the pus through the posterior canal wall. The predominant organism in both these cases was the *Bacillus coli communis*. The furuncle was caused by a scratch from a dirty finger nail. One of the patients died.

The site of election for a furuncle is on the tragus, but such an infection may occur anywhere in the canal. At first, the patient may note merely a small, tender swelling—*i. e.*, a "blind boil." Within a short time, however, a perichondritis develops around the "core" until the entire ear canal is closed. The intense pain is due to two factors, *i. e.*, the perichondrial inflammation and the pressure on the inflamed parts.

Many patients have a tendency toward furunculosis, especially those who have dry ear canals which itch. The patient scratches or else uses some instrument in the ear. It is unnecessary to state that the use of any instrument in the ear canal is harmful and often leads to dire results.

In the early stages of furunculosis or in persons who have a tendency to dry ears, one may avoid any serious developments in the majority of cases by the careful application of a 1 per cent. yellow oxide of mercury ointment.

It is almost impossible to open an ear furuncle under local anesthesia unless it is "pointing." The pain is excruciating. If gas is available, it should be used in preference to ether or chloroform. Many of these small abscesses are deep-seated. Before the anesthetic is administered one should probe for the tenderest spot. An old sharp Graefe eye knife is the best incisor to use. The incision should be made clean and deep until the seat of the abscess is reached. Frequently no pus can be seen, either because one has not reached to the deepest part or because the hemorrhage is so severe

that it can not be seen. However, even if the pus has not been reached, the tension is considerably relieved and the pus will break through in the course of a few hours. After incision, the canal should be packed with a thin strip of gauze soaked in a solution of aluminum acetate. The patient should be instructed to keep the gauze constantly saturated for the first twenty-four to forty-eight hours. A second or third incision may be necessary. New furuncles may form in other parts.

Discharges from the Ear. In describing discharges from the ear, A. Bardes[3] states that the amount and consistency vary greatly. Owing to the glandular activity of youth, the younger the person the more profuse is the flow, as a rule. Most ear discharges teem with disease organisms. As many as ten kinds of germs have been found in the ear of a single person. The commoner pus cocci are generally found in large numbers in nearly all ear discharges. Even in tuberculous infection of the middle ear, so common in children, the tubercle bacilli are found only at the onset of the discharge, for presently the more prolific and ever-present pus cocci predominate and the tubercle bacilli lose their identity. Furunculosis and eczema of the ear canal often result from the contamination of the aural suppuration. Certain kinds of fungi thrive on the debris of a running ear and impart to it a musty, nauseating odor, which becomes noticeable to the sufferer whenever the wind blows into the ear, or when the discharge drops into the throat. Frequently it gives to the breath an offensive odor. In many instances an aural flow drains wholly into the throat whence it is swallowed and absorbed. A sallow complexion, malaise, headache, nausea, and diarrhea are some of the consequences of auto-intoxication from swallowing the pus.

Many individuals have an intermittent aural flow that starts up only when the health is below *par*, as in the presence of a head cold. It is indicative of latent disease in the middle ear. Whenever a discharge is slight, say a drop a day, it clings to the roof of the canal and spreads out like a fan. A leak such as this

(3) Med. Record, Sept. 30, 1916.

is often overlooked, the accumulation being mistaken for hard wax. Generally a slight discharge is more to be feared than a copious one, because it is more readily intercepted. A discharge that is thin and malodorous comes from disintegrated bone and is destructive to the hearing. The presence of polyps or of granulations in the middle ear is also indicative of diseased bone. Blood in the discharge comes from the granulations. Pain in a running ear denotes defective drainage.

Determination of Bacterial Contents of Secretions from the Ear. The Gram stain is especially adapted for a rapid determination of the bacterial contents of secretions from the ear, nose and throat, according to A. B. Bennett.[4] It takes but a few minutes to prepare the specimen for the microscope and it differentiates to a great degree of accuracy the organisms found. Gram-positive bacteria are those which retain the gentian violet after decolorizing and counter-staining, and Gram-negative bacteria are those which do decolorize and take on counterstain.

The bacteria which are Gram-positive are the *Staphylococcus aureus, albus,* and *pyogenes,* streptococcus, *Micrococcus tetragenus,* pneumococcus, anthrax bacillus, tubercle bacillus, lepra bacillus, tetanus bacillus, diphtheria bacillus, diphtheroid bacillus, *Bacillus areogenes capsulatus, oïdium albicans* and mycelium of actinomyces, saccharomyes, Hoffman's bacillus, and *Bacillus xerosis.*

The Gram-positive bacteria which may be considered important from an ear, nose and throat standpoint are the staphylococcus, streptococcus, *Micrococcus tetragenus,* pneumococcus, tubercle bacillus, and diphtheria and diphtheroid bacillus. Each of these can be recognized from its characteristic morphology. The microscope can not differentiate between the *Staphylococcus aureus* and *Staphylococcus albus,* but such differentiation is not important. The recognition of the tubercle bacillus would have to be confirmed by the acid-fast test, and the bacillus of diphtheria can not be distinguished from the diphtheroid bacillus, as both have a changing morphology from dotted to oblong segments

(4) Ann. Otol., Rhinol. and Laryngol., June, 1916.

and, according to some eminent bacteriologists, even the guinea-pig test is not absolute as a point of differentiation.

The Gram-negative bacteria are the meningococcus, *Micrococcus catarrhalis, Micrococcus melitensis, Bacillus typhosus, Bacillus coli communis, Bacillus dysenteriae* (Shiga), *Spirillum cholerae asiaticae, Bacillus pyocyaneus, Bacillus mallei, Bacillus pneumoniae,* Friedlander group, *Bacillus proteus, Bacillus influenzae,* the bacillus of bubonic plague, the bacillus of chancroid, the bacillus of Koch-Weeks, and the gonococcus.

The Gram-negative bacteria which may be considered as important from an ear, nose and throat standpoint are the *Micrococcus catarrhalis, Bacillus pyocyaneus,* the Friedlander group and the bacillus of influenza. Here again recognition becomes fairly easy, as the only Gram-negative coccus is the *Micrococcus catarrhalis.* The *Bacillus pyocyaneus,* while capable of many forms, is usually seen as a rod-shaped organism very similar to the typhoid or colon bacillus, which distinguishes it under the microscope from the Friedlander group, which show a distinct capsule. No bacteriologist will admit the absolute diagnosis of an organism until it has been cultured and tested.

In cases with aural discharge the microscopic examination is much more satisfactory than with discharge from the nose and throat, for the reason that contamination is practically impossible. Of course, if the smear is made from pus lying in the auditory canal, there is a possibility of other organisms being present from the skin about the canal. But if the canal is first wiped dry, the ear inflated and the pus which flows from the middle ear through the perforation caught up on a sterile cotton swab and a smear made, there is certainly very little chance of other than the organism really in the discharge being present.

There were five cases of acute suppurative otitis media in Bennett's series. In two the infection was a pure staphylococcus infection, one was a pneumococcus, and one a pure infection with the diphtheria bacillus. The last case was very acute, having violent pain, rupture of the membrana tympani, and outflow of sero-

sanguineous fluid, a smear from which failed to reveal any organisms—this case ceased to discharge on the second day. The first two patients also made rapid recoveries under simple local treatment.

Of the 160 cases examined there were six cases of acute suppurative otitis media with mastoiditis. Three cases showed a pure pneumococcus infection; two patients made complete recoveries under the use of pneumovaccine and local treatment, and one was operated upon. Another case was of a few weeks duration, the external plate of the mastoid had ruptured, and there was fluctuating pus under the integument. The smear contained a tremendous number of streptococci and fusiform bacilli.

There were sixteen cases of chronic suppurative otitis media. The suppurations had been of from six months to thirty years duration. In two cases there was a pure diphtheroid infection. In three cases there was a pure staphylococcus infection, in one of which there was a marked phagocytosis; in another there was also a Gram-positive fungus present; and in the third there was a prompt cessation of discharge after using vaccine: later the discharge reappeared and was different in character than before, the smears and culture showing a pure infection with the *Bacillus pyocyaneus*.

In four cases the *Bacillus pyocyaneus* was the active cause. One of these cases was of thirty years' duration; both the smears and culture showed a pure infection, and Bennett gave eleven injections of autogenous vaccine, followed by complete recovery. Another case, also of thirty years' duration, contained on the smear a few diphtheroid bacilli and staphylococci, with the *Bacillus pyocyaneus* predominating—the culture was pure *Bacillus pyocyaneus*.

Bennett summarizes his views as follows:

The active organisms infecting the ear, nose and throat are the *Staphylococcus albus* and *aureus*, streptococcus, *Micrococcus catarrhalis*, *Micrococcus tetragenus*, pneumococcus, *Bacillus pyocyaneus*, *Bacillus influenzae*, Friedlander group, and the diphtheria and diphtheroid bacilli. Most of these can be recognized under the microscope by the Gram method of staining. The fusiform

bacillus is readily recognized, also, and rarely seen except when there is decay or caries present.

The spirochetes and leptothrix seem to be inhibited, or at least inactive, in these diseased conditions. When the spirochetes are associated with fusiform bacilli, with the absence of other organisms, the picture is one of Vincent's angina.

The Gram-stained smear is of great value when administering vaccines, because, in the majority of instances, there is either a pure infection readily recognized, or there is a predominance and phagocytosis of one organism to indicate the vaccine needed. Also, the effect of vaccine on the bacterial contents of the discharges can be periodically observed.

The Gram-stained smear is of great value throughout the course of any infection of the nose, throat and ear, to observe the lessening or increasing of the bacteria, and to detect a change of infection from one organism to another.

Last and most important is the conclusion that a study of the smear with a recognition of the type of infection gives a knowledge of the prognosis otherwise unattainable. For instance, an infection with the *Micrococcus catarrhalis,* even if it be chronic, as a rule is generally relieved by simple measures. An acute infection by the pneumococcus is easily relieved and responds well to vaccine therapy. Chronic infections due to the staphylococcus or *Bacillus pyocyaneus* are less quickly relieved, often taking considerable time and patience. The staphylococcus infections are materially affected by vaccine, while the results in using the pyocyaneus vaccine are less certain. The presence in the smear of pus of the fusiform bacillus usually indicates a grave condition with decay or caries. As is well known, the fusiform bacillus can only be found by the smear, as it does not grow on artificial media.

Examination of Ear Discharges. The examination of the discharge from the ear for bone debris in the acute cases and for epidermal cells in the chronic cases is described by A. H. Andrews.[5] It is generally agreed that in most cases of acute purulent otitis media the

(5) Illinois Med. Jour., September, 1916.

mastoid cells are diseased. There is no doubt that in the majority of acute cases with mastoid involvement, the patients recover without a mastoid operation. It has fallen to the lot of most otologists to have watched cases which failed to clear up as they should and which showed none of the ordinary signs of mastoid abscess and yet upon opening the mastoid it was found full of pus and the mastoid cells broken down.

On the other hand, cases are observed showing most of the ordinary symptoms of mastoiditis in which recovery ensues without operation.

That neither the blood count nor bacteriologic findings, nor the constitutional disturbance, nor the ordinary local symptoms can be depended on to give a correct index of what is going on in the mastoid is generally admitted. The lack of constant relation between symptomatology and pathology has caused Andrews to look for and to investigate other indications.

The transilluminator and the *x*-ray have been of material aid in some of the obscure cases, but of even more value has been the microscopic examination of the discharge. In examining for bone debris a rather thick smear is made and immediately dried and fixed with heat. The slide is stained lightly with hematoxylin, washed, dried and examined with a low power objective. Bone particles appear very dark or black in a comparatively light field. These particles have the property of taking the stain and of not giving it up in the washing process. If the slide is stained too deeply we do not get sufficient contrast to differentiate between the bone particles, when present, and the soft structures. Care must be exercised to avoid dirt and dust. The specimen should be taken from the deeper part of the canal or beyond the membrane, especially if the canal has been exposed to the air.

The clinical value of this examination lies in the fact that so long as there is no breaking down of the bony partitions between the mastoid cells it is possible or even probable that the mastoid disease may clear up without operation. When, however, the breaking down process begins bone debris will appear in the pus and the indications are clear for operative interference.

In the chronic cases of purulent otitis media one of the frequent causes of the chronicity is the presence in the antrum or mastoid of an epidermal lining. When the drum membrane is destroyed or when the perforation extends to the margin the skin of the auditory canal sometimes pushes through, encroaches upon and replaces the mucous membrane lining of the middle ear. The natural tendency of the skin to exfoliate is found in this field as in other skin surfaces. If the exfoliated layers are retained in the mastoid or antrum a mass forms which is called a cholesteatoma. This keeps up the discharge, leads to pressure absorption, and is in time likely to invade the labyrinth or cranial cavity.

When there is an epidermal lining of the antrum or mastoid, epidermal cells either singly or in layers, can usually be found in the discharge.

In examining for these cells a thick smear is made and stained with methylene blue. The cells themselves seem to have undergone a sort of waxy degeneration and do not take the stain as well as the surrounding mucous and pus cells. The pus should be taken if possible from the middle ear cavity as this avoids confusion with macerated epidermis from the external surface of the drum membrane or the auditory canal. When there is found an abundance of epidermal cells, singly or arranged in layers, it points strongly toward surgical treatment of the case.

Closure of Perforations of Drum Membrane. Fifteen cases of closure of long-standing perforation of the drum membrane are reported by A. M. Dunlap.[6] After a number of failures in the use of the paper and silver nitrate method he adopted the trichloracetic acid method.

A 10 per cent. solution of cocaine was first applied to the perforation for a few minutes, and then the edge of the perforation was touched with a very small cotton probe wet with a saturated solution of trichloracetic acid. A white eschar forms where the acid has touched, so there is no doubt as to the success of the application. Care should be taken, however, to wipe away all the cocaine from the drum before applying

(6) Laryngoscope, February, 1917.

acid, as the two combine and form a white precipitate. This interferes with the cauterization.

The exact time which should elapse before repeating a cauterization should be determined, however, only after a careful study of each individual case. Two important factors should be taken into consideration in making such a decision: First, the amount of scar tissue which makes up the edge of the perforation; and second, the vitality of the ear drum itself.

The amount of scar tissue can not always be determined at first. A great deal can be learned, however, from the appearance of the perforation, and from the history of the case. Having determined, so far as possible, the amount of resisting scar tissue present, the frequency of cauterization should be regulated by the rapidity with which this tissue is destroyed and granulating tissue secured for the entire circumference of the perforation. Treatment every third or fifth day has worked out best in most cases of this series. Observation has shown that a perforation will not begin to close until there is an entire circle of granulating tissue. Hence, scar tissue which is preventing the growth of granulating tissue must first be destroyed before one can hope to close a perforation. This should be considered the first stage in the treatment.

Early in the treatment of this series it was observed that in cases of long standing a great many cauterizations had to be made before there was any improvement. Furthermore, it was noticed that when a perforation had started to close, the growth was very rapid. All perforations, when they begin to close assume a more or less circular shape, no matter what the previous shape has been. This would substantiate the above statement that in order to close a perforation there must be granulating tissue covering the entire edge.

The next important condition which has to do with the closure of a perforation is the health of the drum tissue. In two cases of the series the membrane had become so thin in the part immediately surrounding the perforation, that no growth of new membrane could be started until the perforaton had been made

much larger by destroying this membrane and a firm base given for growth.

The vitality of the drum membrane should regulate also the frequency of cauterization after the scar tissue has been sufficiently destroyed to produce granulations. This should be considered the second stage of treatment. Each individual case must be studied and the frequency determined by the reaction produced. At times it has been found necessary to use weaker solutions of acid, as the saturated solution apparently destroyed the new tissue. It has been found in these cases that cauterizations during this stage of treatment should be at intervals of from five to seven days.

The tendency probably has been to cauterize too frequently. In one of the earlier cases, treatment had been going on for well over a year without any perceptible decrease in the size of the perforation. Cauterizations had taken place on an average of once every two weeks. The patient was obliged to leave town for a month and when he returned the perforation was about half the size it had been previously. In three other cases of this series the perforations closed after cessation of treatment, while the patients were on vacation, or after they had been compelled to return to their stations.

The size of the perforation has not influenced the final result, though it has in some cases made a difference in the duration of the treatment. Neither has the age of the patient materially influenced closure. The only factor which seems to interfere with a successful treatment is the entire absence of a definite drum membrane at some point in the circumference of the perforation.

Not only has the hearing been considerably improved in practically every case, but there has been no tendency for the tympanic cavities to become inflamed during subsequent attacks of rhinitis. The cushions of air, which Nature has provided, having been re-established in the Eustachian tube and tympanic cavity, there is no longer a tendency for the by-products of rhinitis to pass easily into the Eustachian tube whenever the nose is blown.

Deafness and Disease of the Eustachian Tubes. For the treatment of diseases of the Eustachian tube causing deafness, W. E. Dixon[7] has devised a set of applicators. The instruments are of metal with the distal end curved or bent to an angle of about 45 degrees. The curve or bend should be at various distances from the end, or in other words, we should have from three to five applicators—No. 5 to be inserted one-half inch into the tube; No. 4, three-fourths of an inch; No. 3, one inch; No. 2, one and one-fourth inch; and No. 1, one and one-half inch, the latter to be used only in exceptional cases. To treat the right tube the Holmes nasopharyngoscope is introduced with the corrected upright image into the nasopharynx through the left nostril. The instrument is then adjusted so that the upper half of the mouth of the tube is in plain view. If adjusted so that the entire mouth of the tube is in view, it seems to contort the image so that it is almost impossible to pass the applicator or syringe points for any distance into the tube. This is an important point for the beginner to remember. The applicator having been previously wound with cotton so that the tip and that portion to be inserted, as well as the bend or curve, is covered, it is now dipped into a 5 per cent. cocaine and adrenalin solution and passed through the right nostril with the left hand in such a way that the tip of the applicator is on the floor of the nose. The operator now looks into the scope which he holds with his right hand and sees the applicator as it emerges into the nasopharynx, with its tip pointing downward. Still holding it in this position, he carries it backward and outward into the mouth of the tube, which is from 8 to 12 mm. in a vertical direction, and, remembering that the floor and lower four-fifths of the outer wall of the tube is fibrous and therefore movable, and that the anterior part of the tube is funnel-shaped in the vertical diameter, he makes use of these anatomic facts and at once places the tip on or near the floor of the tube, inserts, and, again remembering that the upper part of the cartilaginous portion of the tube is patent and continuous with the lumen of the bony portion, he

(7) Laryngoscope, June, 1916.

rotates the applicator or syringe tip outward, upward and backward, all the time keeping the instrument after its rotation in the upper part of the tube or between the anterior and posterior plates of the upper portion.

If the operator meets any resistance it is well to pause for a few seconds to anesthetize and deplete the mucous membrane, then gradually pass the applicator a little further, and so on until the isthmus is reached, then leave it in place for a few seconds thoroughly to deplete the mucous membrane. It is well now to withdraw the applicator and immediately introduce another, wound as the first one with cotton, but less abundantly, for at first the operator was feeling his way and had the point well protected for fear of traumatism to the tube. He now wants to accomplish two things—to go through the isthmus, here strictures or adhesive bands are most often found, and, at the same time treat the entire cartilaginous tube with a 1 per cent. solution of nitrate of silver, or perhaps argyrol. Again the same technique is used, but this time a No. 3 or No. 2 applicator, wound very thinly but securely with cotton, is employed. He passes it as before for about an inch into the tube, after first dipping it into a 1 per cent solution of nitrate of silver. It will now pass through the isthmus very readily, providing the tube is patent. The operator, as well as the patient, can feel the peculiar sensation, as with slight pressure the applicator slips through, apparently into a cavity. If the tube is obstructed, either by stricture or fibrous bands, the operator uses the same precaution as to force as he would in passing sounds into the urethra: in fact, force is never justifiable, a slight continual pressure being all that is necessary in any case. Success may not be obtained the first time, but it is better to wait and try again later. Electrodes and bougies, if made properly, can be passed by this technique.

Relation of Eustachian Obstruction to Local and Systemic Conditions and to Prognosis Regarding Restoration of Hearing. C. E. Ide[8] classifies obstruction as temporary due to boggy swelling or inflammation;

(8) Laryngoscope, January, 1917.

or permanent, due to formation of scar tissue with contraction. The causes of the obstruction are swelling of the mucous membrane (congestion or inflammation), the pressure of hypertrophied lymphoid tissue around the tube, hyperplasia (fibrosis) and the formation of scar tissue in the healing of ulcerations.

The location of the obstruction may be at the Eustachian fossa (lymphoid tissue, granulation tissue, papilloma, edema), at the mouth of the tube (fibrosis, scar tissue), in the course of the tube (valve-like webs or pockets), or at the isthmus (contraction by scar tissue).

The obstruction may be a sequel of vasomotor paresis (acidosis), ulceration, chronic infection or irritation (tonsils or teeth).

It may be relieved, at the fossa, by curettage; at the mouth, by incision with the salpingotome and dilatation by bougies; in the course of the tube and at the isthmus, by electrolysis and the use of bougies.

The author has been prompted to write on this subject, he says, because of the large number of patients who come for treatment and state that they have been told that they are beyond help when, as a matter of fact, they can be helped.

However, conclusions regarding Eustachian tube obstruction can not be drawn from brief observation of cases. They must be the fruit of a thorough knowledge of each case and this applies especially to prognosis.

Of the ninety cases forming the basis of this paper, thirty-three of them may be classed as acute and fifty-seven as chronic. Of the acute cases twenty-one were males and twelve were females. Of the chronic cases twenty-seven were males and thirty were females.

The ages ranged in the acute cases from 7 to 52 years; in chronic cases from 10 to 80 years.

In three of the thirty-three acute cases no cause for the obstruction could be ascertained (9 1/11 per cent). The other thirty cases had some relation to other local conditions and the general health through association with, or as sequels of, various conditions.

When Eustachian tube obstruction, due to swelling of the mucous membrane, is present, the common cold will be recovered from sooner, the incident head dis-

tress lessened and the heating conserved by treating the Eustachian tube locally in each case.

In cases of Eustachian obstruction accompanying influenza, ulceration of the lining of the tube often takes place. This, if untreated, results in contraction of the lumen of the tube by cicatricial tissue during the healing process. A large number of the chronic cases are to be referred to this cause.

In cases with ulceration of the tube the cotton on the Eustachian applicator is blood-stained by passage over the ulcerated areas, on its way through the tube to the middle ear. The applicator also often finds pockets in the wall of the tube, or valve-like webs of membrane.

The presence of adenoids in the nasopharynx determines an increase in and swelling of the lymphoid tissue surrounding the proximal end of the Eustachian tube with consequent closure of the tubal opening. Inflamed adenoids are found in patients as old as 66 or 75 years. Since the employment of the nasopharyngoscope as a routine measure in the examination of each patient consulting Ide, the fact has been forced upon his attention that a large percentage (perhaps 50 per cent.) of adults have the remains of adenoids in their nasopharynges which in many cases swell and harbor infection whenever an attack of "cold" or influenza supervenes.

THE MIDDLE EAR.

Differential Diagnosis of Otitis Externa and Otitis Interna.* G. W. MacKenzie[8] has compared the characteristics of the two diseases as follows:

1. *History:* In the case of furuncles, the patient is usually able to recall the fact that he is prone to suffer from attacks of boils or has recently suffered from a boil elsewhere on the body, the back of the neck occasionally showing the evidence. He may even go so far as to state that the present condition in his ear is the same from which he suffered a week or so before.

In the case of otitis media, upon close questioning, the

(*) See also page 188, this volume.
(8) Jour. Ophthal., Otol. and Laryngol., June, 1917.

patient recalls having suffered recently from a cold in the head or an attack of sore throat. He may say that whenever he contracts a cold, the ear becomes stopped up for a few days or longer and with this stopped-up feeling the hearing is diminished. In children, the parents may recall a recent attack of one of the acute infectious fevers, or they may tell us that the school physician had suggested the removal of adenoids several months before and the suggestion had not been acted upon.

2. *Temperature:* The temperature in otitis externa usually runs about normal, the area of infection being too small and circumscribed to permit the generation of toxic substance in sufficient amount to raise the temperature noticeably. Besides, the skin of the canal does not absorb toxic substances readily.

The temperature in otitis media usually runs one or two degrees above normal, even in uncomplicated cases; because of a wider area of involvement than is found in external otitis. Besides, the mucous membrane has greater absorptive function than the skin.

3. *Hearing:* The hearing is reduced in otitis externa in proportion to the amount of occlusion of the canal, but the reduction is never so pronounced as in otitis media. In cases in which there is but slight occlusion, the reduction of hearing is hardly appreciable.

In otitis media the hearing is appreciably diminished in all cases, especially during the height of the process and shortly before spontaneous rupture of the membrane. The reduction of hearing in both cases is of the type characteristic of obstructing disease or diseases of the conducting apparatus.

4. *Tinnitus:* Tinnitus is a symptom rarely found in simple otitis externa.

Tinnitus is more frequently found in otitis media, but not so frequently at that. Its presence is due to one of two conditions and in some instances to a combination of both. It may be due to excessive intratympanic pressure making itself felt at the round and oval windows in those cases in which the tympanic membrane is more than usually resistant and spontaneous perforation is deferred. As a proof of this fact, paracentesis of the membrane generally causes prompt cessation of the

noises. The other condition referred to is active congestion of the internal ear, found in the more virulent infections of the tympanic cavity. In a small percentage of cases this congestion is a forerunner of suppuration of the internal ear. In either case a prompt paracentesis of the membrane is indicated.

5. *Vertigo:* Vertigo, like tinnitus, is rarely found in external otitis. When present it is merely reflex in its origin and is not produced directly from anything existing in the canal.

Vertigo, like tinnitus, is more often found in otitis media and its cause is the same as that which produces the tinnitus, the only difference being the parts of the internal ear upon which the force of the intratympanic pressure or congestion makes itself felt. Usually when the one symptom is present, the other accompanies it. In some cases of congestion of the inner ear the vertigo is sufficiently intense to be manifested objectively by spontaneous nystagmus toward the affected side.

6. *Spontaneous Nystagmus:* Spontaneous nystagmus has never been observed or reported as having been present in external otitis pure and simple.

7. *Pain:* Pain in furunculosis of the canal is always felt at some stage of the process. It is rarely so intense as in the case of otitis media. It may be localized in the canal or referred to parts about it. It behaves like other pains in that it is worse at night, but the nightly aggravations are not so pronounced as in otitis media. The pain and soreness in the canal is aggravated by working the jaws, as is done in the chewing of food.

Pain is found in otitis media and increases in intensity from the onset of the process up to the time of spontaneous rupture or paracentesis where the latter has been performed. It is located deep in the ear and is occasionally referred posteriorly to the mastoid process. It is pulsating in character at the height of the process with decided aggravation at night. The pain practically ceases with spontaneous rupture or paracentesis in complicated cases.

8. *Tenderness:* Tenderness is felt in the ear by any manipulation of the canal and especially when introducing the speculum for examination. Manipulation of

the tragus elicits pain. Besides the tragus feels more rigid to the examining finger than the tragus of the non-affected ear.

Tenderness when present in otitis media, is referred generally to the mastoid process. Slight mastoid tenderness is frequently found early in otitis media, which clears up promptly after drainage has been established without empyema of the cells following.

9. *Fistula Symptom:* Fistula symptom is never present in uncomplicated otitis externa.

The so-called fistula symptom (nystagmus with vertigo upon the compression of air in the external canal) may be present in acute middle ear inflammation and in the absence of fistula of the labyrinth. as pointed out by Alexander and Lasselle and at odd times by the writer. It is more likely to be found in cases in which tinnitus and vertigo are already present.

10. *Narrowing of the Canal:* This occurs in otitis externa in the outer half or cartilaginous portion of the canal and is due to the physical presence of the boil. The narrowing leaves a more or less crescentic shape slit and the direction of the slit depends upon the location of the boil. It may be horizontal, vertical or oblique. The concave side of the crescent corresponds to the convexity of the boil.

The introduction of the smallest speculum permits us, after passing through an isthmus-like narrowed portion, to view the deeper or osseous part of the canal widened quite to its normal proportions with the tympanitic membrane undisturbed.

This may occur in otitis media, but only in the presence of a complicating mastoiditis. In this case the swelling that produces the narrowing is located deep in the osseous canal and in the upper and outer wall, so that the long axis of the slit runs obliquely from above and forward to below and backward. Its direction never varies. The membrane is diffusely red and the anatomic details (especially the outlines of the hammer handle) are obscure. There may be bulging of the membrane. The contrast between the appearance of the membrane in the two conditions is obvious to any one who uses the speculum.

11. *Swelling:* Swelling of the glands either in front or behind the auricle occurs not infrequently in otitis externa. When the posterior glands are involved, there is some possibility of mistaking the swelling for that of periostitis found in mastoiditis. Careful palpation will, however, show the glandular swelling to be circumscribed and freely movable under the fingers.

Swelling of the tissues about the ear may be present in otitis media when complicated with mastoiditis. This swelling is always posterior to the auricle, is more diffuse than in the case of glandular swelling; besides it may be observed by palpation with the finger tips; that the whole periosteum moves less freely over the underlying bone on the affected than on the unaffected side. In the case of very marked swelling over the mastoid, as is found in advanced mastoiditis with characteristic displacement of the auricle, outward, downward and forward, there should be no difficulty in making the correct diagnosis.

12. *Nose and Throat Findings:* Inspection of the nose and throat, not forgetting the Eustachian tube, should be made a part of the routine examination in all ear cases. In the case of otitis externa, the appearance of the parts may or may not be relatively normal. When not, it is a mere coincidence. The picture is entirely different from that found in acute middle ear inflammation.

Inspection of the nose, throat and tube in a case of otitis media, as a rule, will show some involvement of the parts. Among the findings may be mentioned deflection of the septum usually toward the side of the affected ear in unilateral cases, besides evidence of active or recent rhinitis; in the nasopharynx enlarged and acutely or subacutely inflamed adenoids, increased redness and swelling of the mucous membrane about the mouth of the tube corresponding to the side of the middle ear, inflamed with relative narrowing of its lumen and in some cases a small drop of mucopurulent secretion presenting at the mouth; in the fauces enlarged and more or less acutely inflamed tonsils. Not all of these findings are necessarily found in a single case; however, they may be found.

Cholesteatoma of the Middle Ear. Ulrich[9] states that there is still some debate as to whether middle ear cholesteatomata are a secondary growth in the sense advocated by Bezold-Habermann or a tumor developed from an embryonic deposited epidermis nucleus. Up to the present time, the latter theory has failed through lack of convincing proof. In a work presented in 1910 Grünwald states that the cavity can fill up without any immigration of cells. Among other things he discovered masses of elastic fibers in a cholesteatoma matrix. From this finding he concludes that cholesteatomata in whose sheaths elastic fibers are found should be classed as congenital, inasmuch as such fibers are not to be found in the tympanic cavity nor in the bony external auditory canal and therefore could not originate from these structures. This same view is supported by Linck in a recent monograph. This view, however, may be considered untenable because it is a well-known fact that elastic fibers are found in all three layers of the drum membrane and in the mucosa lining the bony portion of the Eustachian tube.

But why should the epidermis of the bony canal (auditory) differ from the epidermis covering of the drum and why the mucosa of the tube differ from that of the tympanic cavity? Ulrich studied the conditions in twelve specimens of petrous bones containing cholesteatomata and found that the bony canal and normal mucosae including the pneumatic cells of the mastoid contain elastic fibers throughout. Furthermore, he showed that in the cholesteatoma matrix there were elastic fibers in greater or less abundance especially in the layers between the epidermis and the bone. Inasmuch as in all the twelve cases according to the conditions found and the clinical course there was no picture of congenital trouble, he came to the conclusion that the presence of elastic fibers is never an indication of congenital origin of the cholesteatomata but rather a regular manifestation of every cholesteatoma.

Siebenmann declares that he has never seen a case of congenital cholesteatoma of the middle ear. He considers tuberculosis to be the chief cause of cholesteatoma.

(9) Cor.-Bl. f. Schweiz-Aertze, Sept. 9, 1916.

The very frequently latent course of middle ear tuberculosis and its frequent development in early years accounts for the widespread belief in the congenital nature of cholesteatomata.

Sections from Otosclerosis. A. A. Grey[1] describes sections from four cases of otosclerosis in which the duration of the condition had been respectively one year, three years, and sixty years. In the case of one year's standing the changes differed from those ordinarily seen in otosclerosis in that there was no deposition of bone, only absorption; hence the diseased parts scarcely stained at all. All that was left were a few blood-vessels and broken-down bone cells. Possibly the absence of deposition of bone in this case was due to the patient being the subject of advanced phthisis. In the case which had existed three years phthisis was present also, but only in an early stage. In this section the newly formed bone stained deeply and was very sharply demarcated. There was no fixation of the stapes. In the third case, the stapes was ankylosed. In all the cases there was but a very fine bridge of bone uniting the stapes to the oval window. In the last case, that of a woman aged 80, the rarefaction had proceeded so far in the wall of the labyrinth that there was practically no bone left behind the foot-plate of the stapes. There had obviously also been a deposit of bone, and the absorption in her case had clearly been due to osteoclasts, not to simple pressure as was claimed by Manassez. In none of the sections was there any sign of inflammatory activity. The tympanic membrane, the organ of Corti, and the spiral ganglion were normal in all four cases. Grey's view is that there was a change in the nerve structures associated with this condition, but the methods of staining used were not such as would enable these to be detected.

Otitis Media.

Treatment of Catarrhal Otitis Media by Irritation of the Drum Membrane. This method, reintroduced by Heath recently, is discussed by W. M. Reed.[2] He expresses some of his ideas and experiences as follows:

(1) Lancet, Feb. 26, 1916.
(2) Jour. Missouri State Med. Ass'n., August, 1916.

Aural catarrh in its early stage, whether suppurative or non-suppurative being accompanied by increased vascularity, swelling and softening, causes relaxation of the fibrous tympanic structures. The fibrous or muscular tissue first becomes hypertrophied and later hyperplastic. then an atrophied condition ensues. Not only the tympanic structures, but the nose and pharynx and Eustachian tube are affected in the same way. The drainage of the nose and sinuses is interfered with, as also the drainage of the tympanic cavity. The secretions become confined and undergo fermentation and decomposition and cause infiltration and congestion of the tissues. Following an acute inflammation of the middle ear, when the active stage is over, vascularity and swelling are removed to a great extent by Nature's process; this removal may be deficient, leaving undesirable thickening and obstruction, and also stiffening of the joints. It may be of the right amount and result in practically normal hearing, and the removal may be excessive and lead to atrophy and relaxation of ligaments and membrane and loss of the resistant continuity of the tympanic chain. This is by far the most frequent termination and one that causes paracustic deafness. The involuntary or reflex action of the stapedius, acting on the relaxed oval window, that is mainly responsible for the altered condition leading to the change in hearing power, known as paracusis, and the voluntary action of this muscle is the cause of the improved hearing. Chronic catarrh of the middle ear either of the suppurative or non-suppurative kind, precedes the atrophied condition or paracustic stage. No one can hear perfectly with the loss of the drum membrane; he may hear fairly well if the labyrinthine windows are in good condition. One of the functions of the drum membrane, and an important one, is to incase the tympanic cavity in order to prevent evaporation of the tympanic moisture, which is essential to perfect lubrication, and necessary to perfect hearing. In catarrh, proportionate surface moisture is diminished and, the secretions being less watery, is necessarily more viscid. Viscidity of mucus is an obstacle to the fine mobility of mechanical structures so light as

those in the tympanum, and lack of mobility means loss of acute hearing.

The stapes and incus are most affected by viscid secretion on account of the proximity to the tympanic walls, and any restriction of their mobility from this cause must necessarily affect the whole chain.

During the past year, Reed has conducted some experiments on a few patients with the treatment that Dr. Heath used four or five years ago and from which he claimed to have obtained such good results. Five bottles were procured and in the first were placed equal parts of blistering fluid (liq. epispasticus) and compound tincture of lavender, the latter for the purpose of coloring. In the second bottle, one of the blistering fluid to three of the tincture, in the third, one to five, in the fourth, one to seven, and in the fifth, one to nine. At first the drum head is slightly touched every day with a tiny cotton mop saturated with the weak paint—one to ten; after reaction to this irritant has rendered the membrane more vascular, a stronger paint is used. There is in different individuals a great variability in the rapidity of inflammatory response to this treatment, therefore the greatest caution must be observed as to the strength of the paint employed. Within a fortnight, a wet and whitish epithelial film forms daily on the membrane; this is regularly removed with a dry cotton mop and to the moist surface thus exposed a paint of the strength which appears suitable is re-applied.

The drumhead gradually thickens. It becomes red and gives off a small amount of discharge, and a thin transparent film forms on the membrane, which is to be wiped off daily, if it is not it becomes dry and will be very difficult to remove; also, if it is not removed it interferes with the daily treatment and renders it ineffective. Further, the close adhesion of this film to the drumhead will cause it to act like a splint and thus prevent the contraction of the membrane, which is the primary object of the whole procedure. When painting the drum care should be taken not to touch the meatus with the mop as it might cause excoriation and lead to production of a furuncle.

Every case is a law unto itself; some patients will

react to the stimulant more readily than others and it may be that now and then it will be necessary to use a stronger solution in order to start a reaction. However, excessive reaction should always be avoided in order to avoid tediously prolonged treatment. If an excessive reaction is produced it is liable to cause a dermatitis, or if the patient catches cold it may lead to otitis media. If the latter condition should arise, however, the increased inflammatory vascularity which it induces, proves beneficial and hastens the cure by the more rapid formation of articular adhesions.

Instead of using the blistering fluid, a less irritating solution may be used. It contains an equivocal amount of active principle as the blistering fluid and equal to it in its ultimate results. It is made thus: Cantharidine gr. 1, potassium hydrate gr. 1, water 300 minims. Equal parts of glycerine and water are used when diluting the solution to the proper strength for use.

If this solution is used one may have to return to the blistering fluid (liquid epispasticus) in order to start the inflammatory reaction, which subsequently may be easily sustained by the use of the cantharidine solution.

At the beginning of the treatment the patient should be told just what to expect because, as a rule, the hearing is made worse for a short time, and unless he understands this he is likely to become discouraged and quit the treatment. He should also be warned not to take any long noisy railway journeys during treatment and more especially immediately afterward. The common practice of holding the nose tightly while blowing into the handkerchief should be forbidden, as also any form of self-inflation of the middle ear.

Symptoms and Treatment of Acute Suppurative Otitis Media. In the interpretation of the symptoms and in surgical management of acute suppurative otitis media, J. J. Pattee[3] says that too much stress must not be placed on the appearance of the membrane. Neither should one ponder unduly about its bulging. We have all seen spontaneous perforation occur earlier than appearances would indicate. If there is earache, some deafness and some alteration in the appearance of the drum, the

(3) Colorado Med., April, 1916.

sooner the membrane is freely incised the better. Pressure and pus are the basic factors on which all the pathologic changes in the mucous membrane, ossicles, and cell walls depend. The longer they exist the greater the pathologic changes and tissue destruction. It is bad practice to permit pressure and the necrotic changes to produce spontaneous perforation. The advantages of the incision are that the pressure is released and the cavity drained. The opening should be made with a keen, thin knife. Such an opening is preferable to spontaneous rupture because it can be placed where it will facilitate drainage and minimize scar formation, advantages vitally important to function.

The laity and physicians recognize mastoiditis when there is redness and swelling back of the ear accompanied by pain and discharge. They are greatly alarmed about these cases and regard them as very serious, in which opinion they are nearly always mistaken, for these cases have passed the danger point by an escape of pus externally through the cortex. Of course such patients should be operated on, but these cases rarely produce brain abscess, meningitis or other complications. On the other hand, cases that do produce intracranial complications do not produce any of these obvious symptoms.

Only the physician in charge who observes the case from day to day can determine which cases require operation and determine the time. Pattee is inclined to operate on all patients who do not respond satisfactorily to a short period of abortive treatment. Early operation will yield very nearly if not fully 100 per cent. of recoveries. Delay is certainly fraught with danger in a number of cases, and the percentage of recoveries is bound to be much lower. Early operation has the additional advantages of conserving a maximum of function and shortening recovery. Granting that an otologist operates early in all cases of mastoiditis as a routine, Pattee believes that he need not operate so extensively or radically as is customarily done by the average specialist today. He has seen no small number of operators remove every bit of cell wall and membrane as carefully as if they were dealing with extensive caries in

radical mastoid work, or with malignancy. He also believes that many operators have been going too far in these acute cases. During early stages of the inflammation there is no definite line of demarcation, and damage has been done by going into areas not already infected.

Trephine for Opening Drum in Purulent Otitis Media. A special trephine for opening the drum membrane in purulent otitis media has been devised by John Guttman.[4] His method is as follows:

The ear canal is cleansed with peroxide of hydrogen and alcohol. In very sensitive patients and in children a general anesthetic may be administered; otherwise local anesthesia may be used. From 3 to 5 drops of a 4 per cent. cocaine solution is injected hypodermatically in the upper wall, at the junction of the membranous and bony parts of the ear canal. After waiting for about five minutes, the drum membrane is penetrated with a trephine of the following construction:

The trephine consists of a hollow steel barrel four inches long, the upper end of which is surrounded to the extent of one inch by a somewhat thicker furrowed steel mantel (as a handle) for the purpose of giving the operator a better grip in turning the instrument; and the lower (distal) end is finely sharpened, in the form of a circular knife, of 1, 1.5 or 2 mm. diameter. This instrument is made by E. B. Meyrowitz, New York.

This trephine is placed in the lower posterior quadrant no matter where the drum membrane may be bulging, because the drainage will always be better the lower the opening is in the drum membrane. If the drainage is good, the bulging part of the drum membrane will disappear spontaneously in three or four days. With one or two turns of the trephine a hole is pierced through the drum membrane. Immediately after the opening of the drum membrane in cases of otitis media catarrhalis acuta, a pulsating, viscid, colorless secretion will make its appearance through the wide opening, and the subjective relief of the patient becomes very marked.

Microörganisms in Purulent Otitis Media. Of all the organisms producing purulent infections of the middle ear and mastoid process, the *Streptococcus mucosus cap-*

(4) Laryngoscope, July, 1916.

sulatus has, according to R. L. Loughran,[5] come to be the one that most arouses our interest.

Experience has taught us that it is an infective organism powerful in its ability to produce extensive destruction of bone tissue, and rapid in its action as well, but chiefly that its effectiveness may not be confined to those acute stages of the disease which we hope to relieve by a complete removal of all affected areas. While active during the acute stages it may lie dormant during an extended period in which the physiologic process of repair is going on, and at some stage when we are secure in the feeling that all possibility of complication has passed, startle us with the realization that our judgment of security was unfounded, by the sudden bursting into action of an exacerbation which we are unable to combat.

This organism is a bacterium closely associated with the pneumococcus, yet having sufficient characteristics individual to itself in its growth in various media, its reaction in immunologic and fixation experiments and its pathologic reaction in diseased tissues, to entitle it to special attention.

Three cases are reported by this author, one of delayed healing, one of sinus thrombosis and one of fatal acute meningitis in which the *Streptococcus mucosus capsulatus* is given credit for causing the trouble.

The author further states that in meeting a *Streptococcus mucosus capsulatus* infection, experience has taught that we are dealing with an organism whose power of rapid and extensive destruction of the mastoid bone may easily be able to combat our best efforts against it and that, in order to conserve our patients' best interest, we must, by early and frequent bacteriologic examination of all discharges in a suppurative otitis media, be in a position to take advantage of every point that could be of value in determining the necessity for operative procedure. And, further, that having made an attempt to stop its destructive course by operation as soon as there is any indication of mastoid involvement, we still have an uncertainty of prognosis to consider until even after the wound is healed and the patient apparently well.

(5) Laryngoscope, June, 1916.

Results of Acute Purulent Otitis Media. While it is generally understood that the results of acute purulent otitis media are dependent upon the powers of resistance of the patient, the severity of the infection, and the time at which drainage occurs, either spontaneously or as the result of paracentesis of the tympanic membrane, F. E. Franchere[6] believes that there is another factor which influences largely the termination of this disorder, and one that has not been given the consideration which it deserves, namely, the differences which may exist in the anatomic structure of the mastoid cells.

Examination of a considerable number of mastoid bones will reveal a great variation in the size, number and arrangement of the pneumatic cells in different specimens, in some instances the cells being large, in others small, some mixed, with large cells posteriorly, in others a few large cells adjacent to the antrum and in the tip, while in still others the posterior portion contains few or many small cells with walls of variable thickness.

The cortex, also, is thicker in some instances than in others, while the extent of the cellular structure seems to vary according to the type of skull from which the bone examined is taken.

It is of interest to know in what manner different formations of cell structure can influence the course and termination of an infection in these parts, and in order to determine this it is necessary to consider briefly the pathology of mastoid inflammation as a whole.

It should be kept in mind that the mastoid cells are lined with a membrane similar to that lining the cavity of the middle ear, and a suppurative inflammation of the tympanum can extend by continuity, and also by the infection of cells distant from this point by contact of pus which has been forced by pressure or gravitated through the aditus and antrum into these relatively distant parts.

In mastoiditis we are not dealing with a true caries, but with a rarefying ostitis which has a definite and extremely interesting pathology.

As soon as infection of the cell lining occurs, the membrane swells to from ten to eighty times its ordi-

(6) Ann. Otol., Rhinol. and Laryngol., December, 1916.

nary thickness, and, becoming lobulated, presents the form of true granulation tissue, while the interstices are filled with bacteria-laden pus.

The cell wall beneath the membrane now becomes studded with osteoclasts which gradually erode the bone until two or more cells are converted into one, and this process continues to the point where the inner or outer table has been perforated. There is now a reversal of this condition. As soon as perforation occurs the osteoclasts disappear and their place is taken by osteoblasts that build up a substance which finally becomes bone of the hardest variety. We know that the greater the relative surface exposed to infection, the greater is its power of resistance, as there is more surface from which may emerge the germ destroying leukocytes, and when we consider the fact that the surface of a sphere increases as the square of the diameter and the contents by the cube, it is obvious that the smaller the cell the greater is its resisting power.

Continuous observation of patients operated on, both as to the nature and virulence of the infection, and as to the size of the cells, shows conclusively that the above theoretical proposition is borne out in clinical experience.

Hysteria Following Otitis Media in Childhood. Siebenman[7] presents the histories of two cases of hysteria with symptoms simulating severe otic affections so closely as to deceive the attending physicians and lead to unnecessary operations. In the first case there was a history of otitis media in childhood. Later there was simulation of gastric ulcer and tuberculosis. In fact, an operation on the stomach had been performed on the basis of the symptoms, but of course with negative findings. Examination of the ear disclosed the following extreme tenderness of the auricle and mastoid on the right side at the slightest pressure. The auditory canal and surrounding area showed no organic changes. There was slight cloudiness of the drum anteriorly. The left ear was normal. Whisp. speech right, 2.5 m., left 10 m. Both sides showed slight impairment of hearing for high and low tones; Weber to the right, bone conduction diminished. The eyes were extremely abducted with

(7) Corr.-Bl. f. Schweiz. Aertz, Sept. 30, 1916.

undulating nystagmus and trembling of the lids. The latter, however, disappeared at a later examination after the patient had been talked to. On walking a straight line, the patient made a few staggering steps and then fell. Caloric and pointing reactions were normal. Under psychic treatment in the hospital the hearing became normal and the tenderness disappeared. Later the patient went home, developed an aural discharge with marked pain, vomiting, vertigo, and fever and was operated on by her family physician for mastoid infection. Pus came from this wound two days later. About ten days afterward, the pain and other subjective symptoms continuing, a radical mastoid operation was performed.

The patient was discharged four weeks later although fetid pus continued to appear. At this time she complained of tinnitus and pulsation in the ear. On examination she showed on the right side a large central heart-shaped perforation with granulating borders, the long process of the incus protruding through the perforation (traumatic). In the tympanic cavity there was a trace of mucus; the canal was dry. Behind was a solidly healed scar, the tip very much reduced, the antral region deeply sunken, but neither dura nor sinus exposed. Hearing: left ear normal; right ear (with noise apparatus in left) Conv. Sp. 7 m.; later 30 cm. for Whisp. Sp.; Weber to right, Schwabach diminished; lower range diminished one octave; vestibular reactions normal; evening temperature (axillary) 38 C. Other patients, however, testified that they saw her rub the thermometer before using it. Control temperature showed 37 C. Under psychic treatment all symptoms disappeared. After the patient went home the author learned that she took morphine, began wearing a head bandage, and finally succeeded in having a third mastoid operation done.

The second patient was a nurse who had had otitis media in childhood. On account of marked subjective symptoms together with aural discharge she underwent first a simple and later a radical mastoid operation with opening of the labyrinth and accidental wounding of the facial nerve, then a facial-hypoglossus anastomosis. Finally, on account of chills and fever she had several

nasal operations on the various sinuses performed in spite of which the pain and fever continued. A sum total of seven operations had been performed on her, resulting in unilateral deafness, facial and tongue paralysis, rhinitis sicca, and morphinism, after which the patient admitted that she had been malingering from the very beginning.

Siebenmann calls attention to another type, *viz.*, hysterical bilateral deafness and deafmutism the result usually of some great shock. These patients in the beginning at least are not voluntarily simulants. Such cases have been observed frequently of late on account of the violent explosions in war. A number of these have been cited by Kummel, Weil, O. Mayer, Urbantschitsch, Behr, S. Marx, Zange, Neumann, and Oppenheim. Zange pointed out that they occur in cases in which the injury has been slight but the shock great and are accompanied by other hysterical symptoms such as hypoesthesia and hyperesthesia of the skin, stammering, dysphasia hysterica, persistent and marked vertigo, tremor, and neuralgias. Usually the deafness is not instantaneous but comes on in a few days. The mutism is aphonic, not aphasic, and spastic as well as paretic conditions in the laryngeal musculature are observed. By testing for simulation these cases can readily be exposed, the patients being easily trapped. In none of these cases is the vestibular function impaired. In cases following shrapnel explosions most observers have obtained prompt and good results by suggestive therapy as well as the use of agents producing unexpected pain such as the faradic current or other electric shock. Lannois and Chavanne treated thirty-two cases and obtained brilliant results in most cases with the very first treatment. Those who resist this method usually recovered if allowed a furlough and an opportunity to rest. In these cases the speech returns first and then gradually the hearing.

Mastoid and Sinus Involvement.

Comparison of Present and Former Methods of Mastoid Surgery. A comparison between the methods used in mastoid surgery ten years ago and the methods

used at the present time show several marked changes, according to P. D. Kerrison,[8] and some phases of the subject in which there is still room for improvement.

A stage of the simple mastoid operation in regard to which there is as yet no uniformity of practice is the treatment of the aditus. Formerly, the simple establishment of drainage was by many considered all that is required, and there are surgeons who still hold and maintain this view. A rational view on this point might be stated as follows: In very recent cases, in which persistent pain or severity of symptoms compel early operation, little treatment of the aditus may be necessary. Why curette the aditus if lined by an intact, though swollen, mucosa, easily capable of a return to normal?

Usually, however, the tympanic lesion sufficiently antedates mastoid symptoms to make this region a seat of advanced pathologic change. Generally the mucosa is eroded and partly replaced by exuberant granulations. If these granulations are only partially removed from the aditus, what remains may shrink and the parts rapidly regain their normal character. On the other hand, a small amount of granulation tissue left in this situation may mark the site of a focus of disease in the underlying bone. Such a focus of disease, if not surgically removed, may perpetuate the tympanic lesion. There is no question that many trying cases of delayed repair and some failures have been due to this cause.

Granulations attached to the roof and posterior wall of the aditus may be quickly and radically dealt with. Frequently a considerable mass of diploic tissue is attached to the tegmen tympani, thorough removal of which provides a much safer postoperative condition.

Granulations occupying the floor of the aditus are frequently attached also to the short process and body of the incus, and greater care is necessary in order to avoid dislocation and even extraction of the incus. Particularly in operating on young children is this danger a real one. Removal of granulations in this situation often brings the incus into view, and sometimes also the head of the malleus. In cases of long-standing

(8) Jour. Amer. Med. Ass'n., Jan. 27, 1917.

tympanic suppuration, which have not reached the stage characterized as chronic suppuration, exposure of one or both ossicles by careful removal of the outer wall of the vault may be necessary in order to bring the vault into a condition favorable to prompt tympanic resolution. This, however, is exceptional. The contention of some surgeons that the incus should be exposed to view as a routine practice in all mastoid operations does not appeal to Kerrison as sound.

Aural surgeons have been particularly slow to see the possible danger of excessive planing or scraping of bone surfaces in mastoid surgery. If the inner plates, either by intent or accident, are actually removed over any considerable area, the underlying dura through its abundant blood supply invariably and almost immediately inaugurates the formation of granulations which are the foundation of tissue repair. Who has not exposed an area of dura over tegmen or covering the sinus and within a few days seen this membrane absolutely hidden by a layer of healthy granulations? On the other hand, if the boundary plate in any part of the mastoid cavity is scraped or reduced to an extent injurious to its vitality, the process of repair is either retarded or actually fails. Theoretically, excessive scraping of the bone may act injuriously in two ways, namely, either by insult to the minute blood-vessels within the bone, as a result of which repair is retarded until the vascular supply is re-established; or by reduction to a point actually destructive to bone vitality. Thus we may have only a superficial or surface necrosis, which later is thrown off in the discharge; or the injury may involve the entire thickness of the bone. Kerrison has seen cases in which, after a puzzling period of delayed repair, the bony covering of the sigmoid sinus has come away almost as a sequestrum, thus paving the way for normal repair.

When we have defined roughly but clearly the confines of our mastoid cavity, that is, have revealed in contour its various limiting plates, we shall do well to avoid over-treatment of these surfaces. For example, when we have removed in bulk the cells attached to the bony covering of the sigmoid sinus, we see at first in the inequalities of this surface the outlines of the cells,

now opened, lying nearest to this plate. With a curette we may easily display our skill in reducing this surface to one of even and polished smoothness. But in doing so we may seriously impair its health and vitality. This, of course, applies equally to other limiting plates of the mastoid cavity. The author believes that many an operator has blamed himself in cases requiring secondary operation for failure to remove all diseased bone when in reality he had erred in the opposite direction, that is, in reducing the bone in certain regions to a degree destructive to its vitality.

There are two causes for excessive curetting of bone surfaces in mastoid surgery: (1) the surgeon's fear of overlooking a series of deeper cells still uncovered; and (2) a more or less general impression among aural surgeons that a smooth and even surface is *per se* a condition favorable to repair. If the bone is healthy it may, and often does, withstand this treatment, but repair is retarded. If diseased, it is safer to leave uncovered dura than dura covered by diseased bone or bone which has been scraped to a degree leaving its vitality in doubt.

The initial incision behind the ear should in its central part be placed at least three-eighths of an inch behind the auricular attachment. In elevating the flaps an effort to save the periosteum from injury is distinctly worth while. In children and women this is usually not difficult over the upper two-thirds of the mastoid. On the other hand, in strong, muscular men, the frequently rough cortex and extensive muscular attachment may make some injury to periosteum even over the upper half of the mastoid inevitable. In any case, attention to this point is of importance, since an intact and unlacerated periosteum is distinctly favorable to postoperative healing.

In healthy wounds, that is, those lined with apparently sound bone and in which no dura has been exposed or even those in which a moderate exposure of healthy dura has been made, the following technique may be followed: A wick of gauze, so infolded that no ravel threads may be left when it is withdrawn, is placed in the depth of the wound with one end at the aditus, the other emerging at the lower end of the wound. Over this

the flaps are approximated and the wound united from its upper extremity to within half an inch of its lower, or tip, end by interrupted silkworm-gut sutures. The sutures are carried preferably through the entire thickness of each flap so as to approximate not only the skin, but also the periosteal, edges. This is not assured by metal clips. A gauze wick fills the auditory canal, and the wound is covered by the usual gauze dressing.

In the postoperative treatment, the dressings are changed daily. On the day following the operation the wick is withdrawn and very gentle pressure with a pad of sterile cotton is applied over the suture line to express serum or pus through the lower (open) end of the wound. The wick removed is then replaced by a much smaller one, which is introduced only from three-fourths of an inch to an inch into the wound. Thereafter the wicks are changed at each daily dressing until there is evidence that they are no longer required.

Dependence on the foregoing treatment is based on the hypothesis that the first wick used establishes a drain or pathway of least resistance along which pus escapes as long as drainage is necessary. The small wicks used in subsequent dressings merely maintain the opening at the lower end of the suture line.

There are two fairly reliable signs that this treatment is progressing favorably, namely: (1) progressive and fairly rapid return of drum membrane and tympanic structures to their normal appearance, and (2) progressive diminution of discharge.

Roentgen Examination of Mastoid. In order to prove the findings in stereo-roentgenograms of the mastoid and to see that the landmarks in the bones of the skull were positively identified, J. M. Ingersoll[9] took a macerated and cleaned skull, sawed off the top of the skull, uncovered the semicircular canals in one mastoid and inserted copper wires in the canals. Stereo-roentgenograms of both mastoids of this skull were then taken, using the same technique that was used in the living subject. These plates gave beautiful stereoscopic pictures of the mastoids and the copper wires located absolutely the position of the semicircular canals. By study-

(9) Cleveland Med. Jour., January, 1917.

ing these pictures and the skull alternately, the following structures can be definitely located: the external and internal auditory canals, all of the mastoid cells, the mastoid antrum, the semicircular canals, the groove of the lateral sinus and the jugular bulb, forming the floor of the tympanic cavity, the foramen lacerum posterior or jugular foramen, the foramen ovale, just anterior to the petrous portion of the temporal bone, the foramen lacerum medium showing dimly through the extreme anterior part of the petrous bone, the groove of the superior petrosal sinus on the posterior superior surface of the petrous bone, the foramen magnum, the grooves of the middle meningeal arteries, and floor of the middle fossa of the brain.

Normal mastoid cells transmit the Roentgen rays better than inflamed cells and slightly inflamed cells transmit the rays better than cells filled with granulation tissue and pus, hence in normal mastoids the cells and their walls and the underlying structures can all be distinctly seen. When there is only a mild inflammation in the cells, as in the early stage of acute otitis media, the cells all look dimmer and less distinct than they do in the normal mastoid. If the mastoid antrum and cells are filled with granulations and pus then the area thus involved shows much less distinctly on the plates. If the walls of the cells have been broken down by the suppuration and are necrotic, then the pictures show an exceedingly dull area which looks very much like an irregular foramen.

Abscesses in the brain apparently transmit the Roentgen rays in about the same way that the brain tissue does, and so do not cast a shadow definitely enough to differentiate them from the brain tissue in most cases.

Stereo-roentgenograms of the mastoid not only give much valuable information about the operative field in cases which must be operated upon, but they also help to determine whether or not an operation is necessary.

In cases of acute otitis media with pain over the mastoid antrum and tip, a stereo-roentgenogram helps very much in determining whether or not it is advisable to operate immediately. If the stereoscopic plates show only a little dimming, compared with the normal, with

no definite dull areas and the cell walls can be distinctly seen, then we may safely keep the patient under observation, for the inflammation in the mastoid will probably subside. If the plates show a pneumatic mastoid or distinctly dull areas in the mastoid, especially in the tip, and some of the cell walls have disappeared, such a case will probably never recover without an operation, and the sooner the operation is done the better is the prognosis.

In chronic otitis media, the stereoscopic plates help to determine the necessity of operative treatment. If the plates show that the middle ear and mastoid antrum only are involved, then there is a fair chance of curing such cases by attic irrigation and local treatment. If, however, the plate show cholesteatoma in the antrum, casting a dense black shadow, or involvement of the cells around and below the antrum, or areas of necrosis, such a case should be operated upon immediately.

Usually in chronic suppurative otitis media the whole mastoid becomes sclerotic, most of the cells disappear, and the stereoscopic plates show the area of involvement in and around the antrum, while the rest of the mastoid looks almost as dense as the petrous portion of the temporal bone.

If the plates show such a sclerotic process and there are no cells remaining in the inferior part of the mastoid, then it is not necessary to go down into the tip of the mastoid in a radical operation, but only as much of the mastoid should be removed as is needed for working space in the antrum and middle ear. In such cases, the patients naturally recover more quickly than those in whom a more extensive operation is necessary.

When to Operate in Acute Mastoiditis. The subject of when to operate in acute mastoiditis and when it is safe to follow non-operative plans is one of the subjects still unsettled. Harold Hays[1] thinks that the prevailing opinion is that the mastoid operation is an emergency operation—that the symptoms of mastoiditis which demand operative interference must be acute is far from the case in many instances. Pain, rise of temperature, tenderness, discharge from the ear, sagging of the postero-

(1) Med. Times, December, 1916.

superior wall of the canal, are signs readily recognized—signs which indicate the necessity for operation.

However, there are many cases of mastoiditis which pass from an acute to a quiescent stage. The symptoms enumerated above, with the exception of the sagging posterior wall and the discharge from the ear may all have disappeared. The patient complains only of the deafness and roaring in the head.

Such cases demand careful watching for two main reasons: first, because the disease has not been cured, evidenced by the profuse discharge of pus and, therefore, serious complications may light up at any moment; secondly, because the deafness of which the patient complains is only too apparent and may result in permanent disuse.

The majority of cases of latent mastoiditis occur in adults in whom the hearing is easily tested. However, the important cases occur in children, who, of course, seldom complain of their deafness and in whom hearing tests are useless.

Although it is important to operate in every case of acute mastoiditis in which the acute symptoms do not subside, it is just as important to operate in cases of latent mastoiditis in which the hearing is evidently impaired. This is particularly true in children.

Although admitting the possibility of recovery without operation in certain cases of mastoiditis, nevertheless one adopts the more conservative measure particularly so far as the hearing is concerned, if he operates before there is permanent destruction of the delicate mechanism which lies behind the tympanic membrane.

Discussion of the Radical Operation. After a critical study of the radical or tympano-mastoid operation, T. J. Harris[2] concludes that the innumerable cases in which it has effected cure is sufficient proof that it has come to stay. Such being the case, what are the reasons for the failures in so large a percentage of cases? In Harris' opinion, the two chief reasons are: First, failure in determining the proper indications for the operation, and, second, faulty technique in the operation or in the postoperative treatment.

(2) Ann. Otol., Rhinol. and Laryngol., December, 1916.

Unquestionably in many instances the radical operation is unnecessarily performed. A suppurating ear extending over a few weeks or months, where the probe shows that no dead bone is present, is not a proper case for the radical operation. Such patients should be subjected to a careful and systematic course of treatment before any operation is to be considered. Especially is this true if the discharge is only intermittent and the hearing only slightly reduced. Proper drainage through incisions in the drum and unremitting care in keeping the nasopharynx clean, will perfect a cure in a large percentage of these cases. Harris concludes:

First, that the radical operation is an operation of undoubted merit.

Second, that it has been in the past and is today being performed often when not called for.

Third, that the results are by no means uniformly good, partial or complete failures occurring in a considerable percentage of cases.

Fourth, that improvement in the hearing can not be promised. The most that can be offered, in the light of our statistics, is that the hearing will not be altered. although there is sufficient risk of lowering or destroying it to warrant reluctance or refusal to operate in case the hearing in the other ear is destroyed.

Fifth, that while accidents, including facial paralysis, are met with in the course of the operation, they are not of sufficient frequency or significance to have any bearing on a decision in regard to the operation.

Operation for Acute Mastoiditis and in Particular Traumatic Mastoiditis. Guisez[3] explains in detail the method of thoroughly opening all the mastoid cells, stating that the mere opening of the antrum does not suffice because true mastoiditis may mean an involvement of even the remotest cells. In adults, he usually employs local anesthesia using novocaine for that purpose. In approaching the antrum, which should be sought for at once, he emphasizes the value of the posterior and superior walls of the auditory canal as the most reliable guide. From the antrum the bone should be excavated in every direction until the furthermost cells are ex-

(3) Presse méd., Oct. 12, 1916.

posed. He calls attention particularly to aberrant cells located above the superior wall of the canal and also within the posterior bony wall. Under special conditions met with he discusses the following:

1. The Sclerotic Mastoid: Here the antrum lies very deep and is hard to find. It is best to approach it by going for the aditus at once which lies astride the posterior wall of the bony canal very deeply below the linea temporalis. It is not always necessary to excavate to the very tip of the mastoid, there being so few cells, but he cautions one to search carefully in those cases in which the bone is sclerotic superficially and pneumatic deeply.

2. An anteriorly lying sinus is exposed at the very start. It is best to expose it widely at once before hollowing out the apex, as there is less danger of injuring it when it is in full view.

3. Bezold's Mastoiditis: Open as usual, resect the tip and follow the pus into the neck to its farthest point, draining it from below.

4. Mastoiditis of War: These cases need careful attention. They appear trivial superficially and are dangerous because of the delay in transporting the wounded to the hospital. They often necessitate a radical operation. These cases are usually infected and often the sinus or dura may be exposed. General anesthesia is required and as many of these cases are complicated with wounds of the external canal a plastic operation is necessary to prevent atresia.

5. In children under 4 years simple antrotomy is all that is required as there are usually no well-developed cells aside from the antrum. In these patients the antrum is generally found lying a little higher and more anterior than in the adult.

Regarding the after-treatment, the author is not favorably inclined to the blood-clot method. In such cases he has often found it necessary to reopen the wound. In cases of extensive injury he does not advocate immediate suture but recommends the open method with packing renewed every day. Also he advises that the auditory canal be packed and care be given the middle ear itself. He concludes by stating that the operation of

simple antrotomy results in more secondary operations than the complete mastoidectomy that he describes.

The Skin Graft in Mastoid Operations. The advantages and disadvantages of the skin graft in mastoid operations described by H. J. Marriage[4] as follows:

The cavity heals much more quickly than by other methods.

Contraction and stenosis of the cavity are prevented, and, at the same time, there is no possibility of granulations extending across various parts of the cavity, and so shutting off cavities which remain unhealed and cause persistent discharge.

The patient is spared a large amount of pain, which formerly was caused by firmly plugging the raw surface of the mastoid cavity.

Both the patient and surgeon are saved much time and trouble, for, about ten days after the grafting operation, the patient is able to do nearly all that is necessary for himself. He need only see his surgeon once a week, and is thus able to return to work much earlier than when he was obliged to attend daily for treatment.

The surgeon is not worried by having to make complicated meatal flaps, many of which cause much deformity of the concha, and, when made, are often difficult to keep in position. All that is necessary is to remove sufficient of the posterior meatal wall to ensure easy access to the antrum and mastoid cavity.

The method Marriage usually employs is to make an incision at the junction of the posterior meatal wall and the concha, and a second incision along the middle of the floor of the meatus, and, after cutting away some of the subcutaneous tissues, suture with catgut the flap so formed to the soft parts immediately behind the ear, so that the skin surface of the flap looks toward the mastoid cavity.

In a large proportion of cases the Eustachian tube is closed and re-infection *via* the tube is thus prevented.

As regards the objections to skin grafting, it has been pointed out that it is impossible to get the cavity aseptic, but, in practice, it has been found that this makes no difference, and that, in 99 out of every 100 cases, the

(4) Practitioner, February, 1916.

graft takes perfectly well, and that, even in the exceptional cases when the grafting is not a complete success, islets of cells are left behind from which the skin quickly grows over the cavity. At the same time, in performing the radical mastoid operation, it is essential to open up all depressions in the bone thoroughly, so as to make sure that septic cavities are not left behind the graft; it is also necessary that the graft should be extremely thin.

After cutting a meatal flap, he cuts down the posterior bony meatal wall as much as possible, and then scrapes out the tympanum, removing the whole of the mucous membrane, except a very small margin around the stapes, after which the opening of the Eustachian tube is curetted with a small, sharp spoon. In order to disinfect the cavity and check the bleeding, he next pours in hydrogen peroxide (20 vols.), which is left in for two or three minutes, and then syringed out with normal saline at 105° F.

This is done three times. The cavity is immediately plugged with gauze, the plug being left in while the graft is cut, and only removed when everything is quite ready for applying the graft. This is carried to the ear on a section lifter, and got into position by means of the suction apparatus recommended by Ballance. It is kept in place by the immediate insertion of a long strip of ribbon gauze, half an inch in width, on which has been dusted some aristol powder to prevent the discharge from becoming offensive. No protective of any sort is used. The end of the gauze is passed through the meatus, and the free end of the graft which is lining the posterior part of the cavity is folded over the plug and also brought out through the meatus, so as to cover its cut edge. After ligating the vessels which have been caught with artery forceps during the operation, the skin opening is sutured so as to bring the ear back into its normal position.

The plug is left untouched until the fourth day after the operation, when it is withdrawn and the cavity syringed out with a weak solution of hydrogen peroxide, a small piece of ribbon gauze being again lightly inserted to soak up the discharge. The same treatment is con-

tinued daily for about one week, when all plugging is stopped and plain hydrogen peroxide (10 vols.) is dropped into the cavity twice daily. The patient is seen at intervals of about seven days, so that any small areas, which are granulating too freely, can be cauterized with silver nitrate or scraped with a sharp spoon.

The superficial part of the graft gradually separates, and usually comes away when the ear is syringed, but it may be necessary to remove it with forceps.

Malaria and Mastoid Disease. That malaria has a wide range of manifestation is further shown by a case of apparent mastoid disease reported by C. W. Richardson.[5] The patient, a woman, 21 years old, was admitted to the Episcopal Eye, Ear and Throat Hospital, Dec. 8, 1915. Family history was negative. There was marked evidence of great prostration, the patient requiring support in walking. She was very pale. She had acute suppurative otitis media on Aug. 15, 1915, with spontaneous rupture of the membrana tympani. The discharge continued until Nov. 6, 1915, when it ceased. At this time post-auricular pain became manifest and gradually grew worse, with swelling back of ear and in neck. About a week later headaches occurred, which were not constant and confined to occipital region. She vomited at times. About the second week in November she had chills which were unattended with sweats. She complained of great thirst and drank abundance of water. The urine at that time was scanty and very dark. During the few days before consulting Richardson she had marked pain over the mastoid region. For two weeks she had noticed gradual diminution of vision.

Examination: Left ear normal. Right ear shows a central kidney-shaped perforation. Ear dry. Pressure over mastoid, as well as along course of jugular vein, causes pain. No edema. Pulse 120. Temperature 101 F.

Slight exophthalmos. Pupils widely dilated, but reacted to light and accommodation. No nystagmus. Vision impaired. Figures at ten feet. Eye-ground shows bilateral papillitis, with hemorrhage and exudate around

(5) Ann. Otol., Rhinol. and Laryngol., September, 1916.

vessels. Arteries small. Veins congested and tortuous. No exudate at macular region.

Examination of ears demonstrated them to be as given in the history. The tenderness over the right mastoid was very great, as well as along the course of the jugular vein. When the patient was placed upon her feet and told to walk, she would advance a few steps and then begin to totter, showing rather an evidence of weakness than of any central lesion. The double optic papillitis also excited the author's suspicion, as there were no evidences of any acute cerebral lesion that could account for its centric origin. The head pain, the pallor and the slight mental hebetude inclined him to await an examination of the urine and blood before making a diagnosis.

The urinalysis made from urine drawn by catheter was as follows: Color, dark brown, very turbid. Specific gravity 1023. Reaction, acid. Sugar, considerable quantity. Albumin, trace. Microscopic: Casts, granular, hyaline and epithelial, with a predominance of granular. Many disintegrated blood cells.

Blood Examination: Malarial parasites present. Leukocytes, 8,800.

The patient was given quinine in large doses, large draughts of water, the Murphy drip and hot packs. Under this treatment the temperature gradually subsided from 101.2 F. on entrance to 99 F. On December 11, there was a rise in temperature to 102 F., unattended with chill, which subsided to normal December 12. From December 12 until the patient was discharged the temperature was flat. Blood examination, made after December 12, demonstrated freedom from malaria. The urinalysis showed normal urine after December 16. The mastoid tenderness and the general condition of the patient improved from day to day. The papillitis improved considerably, and the vision became clearer, but neither had returned to the normal when the patient was discharged.

Double Cavernous Sinus Thrombosis. A case of double cavernous sinus thrombosis is reported by W. T. Patton.[6] He cites as the causes of this disease:

Septic thrombosis of the cavernous sinus, is any in-

(6) Southern Med. Jour., December, 1916.

fected lesion in the area drained by the ophthalmic vein or its branches. Pustules on the face, nostrils, eyelids, etc., purulent affections of the accessory sinuses, nasal, pharyngeal or buccal cavities, facial erysipelas, infected wounds of this region, etc., may be the cause. Also it may occur from mastoiditis through the lateral sinus into petrosals and then into the cavernous sinus.

The symptoms naturally divide themselves into (1) the local and (2) the general. The general symptoms are those of sepsis under any and all circumstances. The local symptoms may, following McEwen's scheme, be divided into (*a*) those due to venous obstruction and (*b*) those due to pressure on the nerves. Venous obstruction causes edema and chemosis of the affected area, *viz.*, the orbit, the skin of the nose, forehead, cheek and sometimes the fauces, the pharynx and the neck. The exophthalmos, which is a prominent symptom, is due to engorgement of the tissues of the orbit.

Pressure on the nerves causes characteristic symptoms. The nerves involved are the second, third, fourth, sixth and the ophthalmic division of the fifth.

The visual disturbances are usually very marked, due to pressure on the optic nerve and edema of the retina, while the motor disturbances are most pronounced in the parts supplied by the third. The dilated pupil, divergent squint and ptosis have been seen in cases reported. The ophthalmoscope shows dilated and tortuous retinal veins and edema of the retina. The disturbances due to pressure on the fifth nerve are variable.

A very important and characteristic symptom arises from the fact that while the trouble is unilateral at first, the thrombus soon spreads to the other sinus, and obstruction and other symptoms appear in the areas drained by it. The edema of the lids of the second eye, beginning at the inner canthus, and not due to direct extension, the parts at the root of the nose lying between the eyes being normal, is very characteristic.

The prognosis in septic cases is uniformly bad. In one of the series reported by Dwight and Germain operation was performed, and they think the results are promising. Since the prognosis otherwise is absolutely bad, it seems proper that operation should be tried.

Other than this the treatment is supporting and symptomatic.

Unusual Case of Sinus Thrombosis. J. H. Foster[7] reports a case of sinus thrombosis in which at the operation the jugular was found with difficulty, being collapsed below the level of the thyroid vein, and consisting of a mere fibrous string. When the thyroid and common trunk of the facial and lingual veins were tied and cut, the vein was dissected out and found necrotic above, pulling out with slight force.

The author sums up the unusual features of his case as follows:

1. The occurrence of this trouble a few days after apparent healing of a middle and external ear infection.
2. The presence of Klebs-Loeffler bacilli in the ear discharge. These disappeared after the administration of the antitoxine and were never found afterwards in the discharge. There was never anything about the appearance of the wound suggestive of a diphtheritic infection. The disappearance may have been only a coincidence.
3. The complete absence of mastoid pain or tenderness and the reference of the pain to the corresponding frontal region, while the *x*-ray plates showed definite involvement of the mastoid cells.
4. The late extension both downward and backward of the infection of the lateral sinus, when at the time the sinus was opened there was only a small parietal clot, and the wall was removed well beyond any apparent disease.
5. The finding of the abscess of the cerebellum in removing the necrotic inner wall of the sinus.
6. The occurrence of circumscribed sloughs in the soft tissues of the wound which were accompanied by rigors and rises of temperature from time to time.
7. The absence of metastatic foci of infection.

General Symptoms of Sinus Thrombosis. The general symptoms of sinus thrombosis are given by J. H. Barnes,[8] who also reports an unusual case. The author observes that sinus disease usually occurs as a compli-

(7) Southern Med. Jour., April, 1916.
(8) Southern Med. Jour., April, 1916.

cation of acute exacerbation of a chronic otitis media rather than of primary mastoiditis.

The mastoid is usually tender on pressure with more or less headache. The symptoms that are diagnostic are a severe chill with high fever, which is 103 or 104 F. while the chill is still on, and then rises to 105 or 106 F. in a short time, followed by sweat and a lower temperature, even down to normal. Then in a few hours or a day or two we have recurrence of the chill with the same symptoms. The chills are very irregular as to time, but the character of the chill, fever and sweats are the same in each attack. The patient may feel quite well between the attacks.

If the sinus becomes involved low down next to the jugular foramen, the vein below becomes tender and may appear as a hard cord in the path of the jugular vein just under the anterior border of the sternocleidomastoid muscle.

The pathology begins as a phlebitis. There is a deposit thrown out on the inside of the vessel which becomes larger till soon a clot is formed which fills the sinus and the circulation is cut off. If this clot is infected and the germs are thrown into the circulation we have the symptoms as given above, those of severe septicemia. The clot may be sterile and the phlebitis be so walled off as to protect the circulation. Then the severe symptoms are absent and the patient may recover without surgical interference.

The complications are brain abscess, meningitis and an extension of the infected thrombosis to the other sinuses. There may be metastatic abscesses and pneumonia.

The treatment is of course surgical. The mastoid cells should be cleaned out thoroughly and the sinus exposed. Before it is opened the jugular should be tied off below so as to protect the general circulation.

INTERNAL EAR

The Relation of the Ear to Vertigo and Seasickness. This subject is discussed by L. Fisher and I. H. Jones[1]

(1) New York Med. Jour., July 15, 1916.

who state that the most recent work on the ear makes it clear that vertigo is not some general manifestation accompanying disorders in this, that, or other organ, but that it is a peculiar and definite disturbance perceived within the brain itself just as sight and hearing are perceived in the brain, and that the vertigo impulses are transmitted thereto through the vestibular portion of the ear and its associated paths.

The inner ear consists of two distinct organs, both housed in the same cavity: (1) A cochlear portion which attends to the function of hearing; (2) a vestibular or static portion with equilibration for its function. The static labyrinth consists of a saccule, utricle, and three semicircular canals. The saccule presides over linear movements in a lateral direction, the utricle recognizes linear movement in an anteroposterior direction, and the semicircular canals control rotary or turning movements in all conceivable planes. It is particularly important that the relation of the three semicircular canals to these planes be borne in mind in a discussion of vertigo. The semicircular canals have each a bulbous swelling on one end in which is placed a group of sensitive hair cells, capable of excitation. The eighth cranial nerve or "auditory" nerve, so-called, conveys impulses from the whole labyrinth, and consists of two distinct parts—the cochlear which carries fibers of audition and another distinct vestibular portion which carries fibers of equilibration. When this combined bundle, or eighth nerve, reaches the brain stem, it breaks up into its two component parts, the cochlear portion going one way and the vestibular going another.

The normal human organism depends in a great measure upon certain special senses, such as sight, taste, hearing, olfaction, etc. Among those is one, not generally known as a distinct special sense, but yet existing and of the utmost importance, namely, the static sense, *i. e.*, a special sense whereby we are enabled to maintain our proper position in space.

By vertigo is meant a subjective sensation of a disturbed relationship of one's own body to surrounding objects in space. That the labyrinth was a factor in maintaining the equilibrium of the body was suspected

by numerous observers for many years. But it was not until 1860 that this relationship was established as a clinical entity. In that year Ménière, of Paris, published his epoch making paper, in which he described that train of symptoms always referred to thereafter as Ménière's disease. Many others followed him and made contributions to the subject, but no work has equaled the recent brilliant efforts of Dr. Robert Barany, of Vienna. That his work on the physiology of the labyrinth was of more than passing interest was attested by his receiving recently the Nobel Prize, awarded annually for research work in medicine. He has established, beyond doubt, that the static labyrinth constitutes the chief organ of equilibration. It accomplishes this by being most intimately connected through the central nervous system with nearly every portion of the human organism. The nerves connecting this vestibular portion of the labyrinth with the rest of the body may be spoken of as the vestibular paths or tracts. Stimulation, or irritation, or destruction of the labyrinth, or of any portion of the vestibular tracts, induces vertigo or dizziness with associated loss of equilibration. This does not mean that irritation of the ear itself is the sole and only way of producing vertigo. We all know that various visual disturbances, cardiovascular affections, gastric or alimentary disorders, etc., may exhibit vertigo as a symptom. What the authors wish to impress, is that in the latter instances it is the direct action on the vestibular apparatus that is responsible for the induction of the vertigo. The stomach of itself, the kidneys, the heart, etc., can no more produce vertigo, than they can produce sensations of flashes of light, hallucinations of sound, or obsessions of smell.

Vertigo produced by inflammatory or other conditions of the ear itself can be differentiated from other kinds of vertigo by an examination of the ear. When attempting to determine the origin and nature of vertiginous attacks, so that an intelligent prognosis can be given and proper treatment instituted, it is absolutely essential to determine the functional activity of every portion of the inner ear. The acoustic labyrinth is therefore carefully tested by means of tuning forks, while the static

labyrinth is examined most scrupulously by the new labyrinthine tests. These tests enable us to determine the functional value of the various portions of the inner ear, and also to demonstrate any affection or interference with the vestibular paths connecting the labyrinths with the central nervous system. Many of these vestibular paths are well known and definitely located. Clinically this knowledge is of the greatest interest and importance as we are enabled by means of these tests to locate with a good deal of accuracy lesions within the cranium, particularly so if they happen to involve those paths themselves.

The principle underlying all labyrinthine tests is this: Movement of the endolymph in the semicircular canals in a given direction, stimulates the sensitive hair cells in these canals, and produces definite phenomena. These phenomena are: (1) A twitching of the eyes or nystagmus of a certain type; (2) vertigo; (3) so-called "past pointing;" (4) falling reactions. In a person to be examined this endolymph is artificially set in motion, either by turning the subject in a smoothly revolving chair, or by douching the ear with cold or hot water. The reactions following are carefully observed. With a knowledge of what these reactions should be in the normal, and knowing furthermore that in a normal individual they are remarkably uniform and constantly present, we are able to recognize that any deviation from the normal, or a complete absence of some or all of the reactions, is significant of a disturbance either in the labyrinth or somewhere along the vestibular tracts.

Sensation of movement in the horizontal plane is produced by horizontal canal or canals only. This is experienced by the subject when he is turned with the head in an upright position.

The sensation of turning in the frontal plane is produced only when the vertical canals are influenced in that plane. This can be produced in a subject by turning him with the head placed forward or backward, in which position the plane of the head is frontal. If, after such turning, the head is permitted to remain in the forward or backward position, the sensation that the subject experiences is one of turning in the frontal plane,

namely, a movement about his own axis, either to the right or to the left. As it is a sensation of turning in a plane parallel to the floor, or the horizontal, it is not unpleasant. If, however, the head is then raised to the upright position, the frontal plane now assumes a position at right angles to the floor, and the subject has a sensation of falling either to the right or to the left, which is therefore unpleasant.

The sensation of turning in the sagittal plane is produced only when the vertical canals are influenced in that plane. If a subject is placed in a chair with the head inclined well over toward the shoulder, his head is then in the sagittal plane. If he is turned now with the head in that position, the resulting subjective sensation is one of turning in that same sagittal plane, which, however, (in this position of the head), is parallel to the floor. The sensation is therefore the same as that experienced after being turned with the head upright, namely, a movement about one's own axis either to the right or to the left. As it is a sensation of turning in a plane parallel to the floor, it is not unpleasant. If, however, after such turning, the head is raised to the upright position, the sagittal plane assumes a position at right angles to the floor, and the sensation is that of falling in the sagittal plane, namely, pitching forward or backward. This is unpleasant.

In connection with unpleasantness from these turning sensations, we may consider seasickness. *Mal de mer* is unquestionably an ear phenomenon. As Barany has stated, the reason that this is not generally recognized is that the phenomena of the labyrinth and the vestibular apparatus are not generally understood. In 1881, Champeaux first showed the close similarity between Ménière's disease and seasickness. In both conditions there is an aura consisting of a sensation of flashes of color before the eyes, and a breaking out of sweat; there is vomiting of a projectile type, which occurs very easily and produces only temporary relief. In both instances the sufferer feels worse on attempting to stand or move about and shows distinct ataxia; lying down and closing the eyes usually results in some relief. Headache is

present in both instances and occasionally there is a nervous diarrhea after the vomiting.

Deaf and dumb people do not become seasick. This was first brought out by W. James. Similar proof of the relation of the ear to seasickness was proved experimentally by Kreidl. He constructed a floor on which he rocked animals, indicating the movement of a ship at sea. He was able to make the animals sick in this way. He then operated on the animals and severed both eighth nerves. When they recovered he conducted the same experiment and found that they could not be made seasick again. Trotsenberg makes the observation that in very small children seasickness is uncommon, bringing out the fact at the same time that douching the ear with cold water in children similarly fails to produce nausea. This may be explained by the fact that the vestibular apparatus of small children, not yet being highly developed, shows but little response either to the movement of the ship or to experimental stimulation of the ear by douching.

Barany has shown that persons who show no response to stimulation of their ears experimentally can not be made seasick. This is substantiated by our own experience with patients who have "dead" or non-reacting labyrinths. Barany also brings out the following interesting facts: Persons who by stimulation of the ears become easily nauseated also become seasick easily. Neurasthenics are sensitive to being turned in a chair or having their ears douched, and they also become seasick easily. Persons who become seasick from certain movements of the boat, also become seasick by the very same kind of vestibular stimulation. The manner of onset and the persistency of the nausea are the same in seasickness as in experimental vestibular stimulation. Furthermore, the sensations after seasickness are the same that we have after being nauseated by violent vestibular stimulation. Any means which would help against seasickness, such as altering the position of the head, helps as much against the unpleasant sensations experienced when one is being turned in a chair. After getting back to land the seasick person quickly becomes

perfectly normal again; in the same way nausea produced by violent vestibular tests quickly disappears.

Seasickness is therefore an ear phenomenon, by which we mean that the end organ of equilibrium, namely, the static labyrinth, is disturbed by the unaccustomed movement of the boat or ship. The tossing of a ship may be analyzed as movements in the following planes:

1. The horizontal plane from right to left and from left to right. This movement, however, is usually very slight and unfortunately, as we have already shown, it is the only plane of movement that is not unpleasant.

2. The frontal plane, namely the rolling of the ship from side to side. If the subject is standing facing the bow of the ship, such a movement will influence the vertical semicircular canals in the frontal plane. Such stimulation is unpleasant. If, therefore, the subject lies down with his head toward the bow or stern, the rolling movement would then affect the horizontal canals and the unpleasantness would disappear.

3. The sagittal plane, namely, a pitching of the ship fore and aft. If the subject is standing facing the bow of the ship, such a movement affects the vertical semicircular canals in the sagittal plane. The resulting sensation is extremely unpleasant. If, however, the subject lies down with the line of the body extending across the ship from starboard to port, then the pitching movement affects the horizontal canals instead of the vertical and the unpleasantness disappears.

The up and down movement of the ship, that is, the rising and the sinking, in a similar way affects the vertical semicircular canals when the subject is in an upright position. The resulting unpleasantness is again relieved by the subject lying down, since then the up-and-down movements affect the horizontal canals instead of the vertical, the stimulation of which is so much less unpleasant. Unfortunately the movement of the ship seldom takes place in one plane only. It is the combination of the various planes which plays havoc with the semicircular canals.

In consideration of these facts, to speak of the rôle that the ear and the ultimate tracts play in the production of vertigo, is like speaking of the rôle the heart

plays in the production of cardiac murmurs. A normal static labyrinth and vestibular mechanism see to it that we have no vertigo. They accomplish this by keeping the central nervous system continuously informed of our position in space with relation to objects around us. In the presence, however, of some pathologic condition in the labyrinth or along any of its paths, the perfect performance of this function is no longer possible. Objects around us do not appear as they should. They either move or dance before us. Our own bodies feel no longer stable and secure upon the ground—in other words, we are dizzy or are experiencing sensations of vertigo which, if serious enough, result in our inability to move about or stand upright.

Ear Symptoms and Disease of Central Nervous System. That symptoms usually considered as of vestibular origin may be caused by disease of the central nervous system is shown by G. E. Shambaugh,[2] who reports a case of syringomyelia producing nystagmus disturbance of equilibrium and vertigo. He states that an important chapter has been added to otology by the recent studies in the physiology of the vestibular part of the inner ear and by the analysis of the symptoms arising from disease of this mechanism. The pursuit of these studies has led the otologist into an examination of the symptoms arising from disturbance of the central tract of the vestibular impulses, and has thus brought his work into close relation with that of the neurologist. In making a diagnosis of intracranial lesions the neurologist can often be assisted by the intelligent coöperation of the otologist.

In studies of the vestibular mechanism we have arrived at a satisfactory working basis for the interpretation of the symptoms arising from disease of the labyrinth and for the diagnosis of the several forms of labyrinth disease. On the other hand, in the interpretation of the vestibular symptoms arising from disease of the central nervous system, and in the diagnosis of these central lesions, we have made scarcely more than a beginning. We are still apparently on the threshold of what is to be a most valuable field for work. For these reasons it

(2) Ann. Otol., Rhinol. and Laryngol., December, 1916.

is still of great importance that cases should be reported where a diagnosis of disease of the central nervous system can be established, and in which there are distinct vestibular symptoms.

It is evident, says Shambaugh, that a long-standing disturbance of sensation to temperature as shown in the history of the case, the marked disturbances of sensation to temperature and pain, and the much less marked disturbances to touch, make a diagnosis of syringomyelia the only one possible. The condition of the reflexes, as well as the slightly marked motor disturbances, conform well to this diagnosis. The history and the condition of the spinal fluid exclude syphilis. The decrease in sensation to temperature over the neck and back of head, demonstrates that this syringomyelic process has reached up to the medulla oblongata. It is therefore quite natural to assume that the nystagmus in this case depends upon an extension of the syringomyelic process up into the region of the fourth ventricle (syringobulbia).

The Labyrinth a Compass. Guttich[3] says that turning of the eyeballs in the opposite direction accompanying various head movements has been known for 100 years. If the head is bent over to the shoulder the eyes do not follow but they alter their position in the orbits so as to occupy the perpendicular meridian up to a certain angle of the inclination of the head. This faculty of the eyes to maintain their position independent of the head position within certain bounds arises from a labyrinthine innervation as demonstrated by Barany. The latter found that normally of the first 20 degrees of head inclination the eyes were raised one-third of the distance, of the second 20 degrees one-fourth, and of the third 20 degrees one-fifth. This function is not dependent on the vision as it occurs even better in the blind.

In some animals, the angle which the eyes maintain with the line of the head movements is much greater than in man. In rabbits the inclination of the head reaches an angle of 40 degrees before the eyes are pulled out of their perpendicular meridian. At extreme down-

(3) Deutsch. med. Wochenschr., Sept. 21, 1916.

ward bending of the head the greatest angle with the meridian of the eyes is more than 90 degrees.

Among birds there is a different condition. In the first place instead of nystagmus following caloric, turning, or galvanic stimuli as in man they show ossilatory head movements, so-called "head nystagmus." In most birds the atlas has a wide range of movement while on the other hand the range of motion of the eyeballs is limited. Birds always attempt to keep the head erect so that the plane of the eyeballs is horizontal.

The author considers this "opposite tendency" of the eyeballs to head movements as a compass function. He considers this function better developed in birds because any turning of the eyeballs is accompanied by a compensation in the horizontally maintained head position. Aviators claim that in thick clouds they have difficulty in maintaining the horizontal. It must be that the human has lost this compass function because our heads do not respond to the weak impulses from the "opposite rolling" apparatus. He believes further animal investigation necessary for the development of this subject.

Labyrinthine Involvement via the Ductus Endolymphaticus. Two cases of involvement of the labyrinth by way of the ductus endolymphaticus are reported by N. H. Pierce.[4] He says that involvement of the labyrinth secondary to inflammation of the saccus, or by way of the ductus endolymphaticus, is very difficult to prove postmortem; the literature on the subject is, therefore, very meager. Cases have been reported in which there has been found no demonstrable fistula in any of the semicircular canals, the footplate of the stapes, or the promontory, and in which the labyrinthine suppurative process has eventuated in a fatal meningitis, the saccule having been proved, microscopically, to have been involved directly from the bone upon which it lays, this having become softened in the course of an acute or chronic mastoiditis, or in the course of a sigmoid sinus thrombosis.

Pierce emphasizes the following points:

The saccus endolymphaticus may be involved more

(4) Ann. Otol., Rhinol. and Laryngol., December, 1916.

frequently than is usually supposed in acute softening processes of the mastoid.

It is our duty in all cases of mastoid involvement without external manifestations except temperature, to search very thoroughly for softened areas deep down in the bone, and not cease until we come to healthy structure.

We should always bear in mind in suppurative labyrinthitis not only to open into the bony labyrinth, but to explore the region in which the saccus endolymphaticus is situated.

Within the first few days serous labyrinthitis can not be differentiated from suppurative labyrinthitis by any diagnostic means at present at hand.

Absence of globulin, presence of lactic acid, absence of sugar, may be noted in inoffensive serous meningitis.

In the cases mentioned, viable microörganisms were not recovered from the cerebrospinal fluid, which, in his opinion is the only differentiating point between spreading suppurative meningitis and serous or circumscribed meningitis.

Several lumbar punctures were made in the course of the week following the appearance of meningeal symptoms; that is, whenever the headache, stiffness of the neck and temperature increased. These punctures were invariably followed by improvement, as evidenced by decrease in headache, stiffness of neck and temperature.

Methods of Testing the Labyrinth. The value of the galvanic method of testing the labyrinth and eighth nerve as compared with the caloric and the rotation method is pointed out by G. W. MacKenzie.[5]

In making the galvanic test there are certain essentials. (*a*) A suitable electrical apparatus with clean contact points; (*b*) even more important is an accurate milliamperemeter; (*c*) a reversing switch under the control of (*d*) a capable assistant who controls the polarity, the amount of current and observes the milliamperemeter; (*e*) two electrodes, one about two inches square and flat, and the other a small ball electrode (about a quarter inch in diameter although one-half inch will

(5) Trans. Amer. Laryngol., Rhinol. and Otol. Soc., 1916.

work satisfactorily). Both electrodes should be wrapped snugly in moist cotton or gauze.

Before starting the test, examination should be made to see if the patient has any spontaneous nystagmus. Its presence or absence should be noted on the patient's record. After soaking the electrodes and the parts to which they are to be applied with warm salt solution we are ready to begin. The large flat electrode is held by the patient, it does not signify in which hand. The patient's head is tilted slightly backward to permit of better observation of the eyes by the examiner; while he is directed to look straight ahead, which in effect is slightly downward, considering the position of the head. The examiner elevates the lid of the eye to be observed with the thumb of the left hand when applying the ball electrode with his right hand to the patient's left ear and *vice versa*. The ball electrode is applied to the tragus and the tragus is pushed into the external canal.

MacKenzie finds that in normal ears it requires about 4 milliamperes to produce nystagmus and that the cathode produces nystagmus to the same side and the anode causes nystagmus to the opposite side. He has examined a few thousand cases including normals, deaf mutes, one-sided labyrinth destructions, acute and latent labyrinth suppurations, old cases of plastic labyrinthitis, unilateral and bilateral, recent as well as old cases of meningitis, some with complete and others with partial loss of function, hemorrhage in the labyrinth; fistulas in the labyrinth; internal auditory canal tumors; herpes zoster; multiple neuritis of the cranial nerves; early and late syphilis of the internal ear and nerve; skull fractures; gunshot wounds of the ear; cases with middle ear catarrh; others with middle-ear suppuration with hyperemia of labyrinth.

His conclusions are:

The galvanic test is more accurate than either the caloric or rotational test in determining the function of the semicircular canals.

Besides being more accurate, the galvanic test is the least annoying to the patient, the most sensitive and the easiest to control of the labyrinthine tests.

The galvanic test can be applied as an unilateral test

of semicircular canal function in all sorts of pathologic condition, which is an advantage that cannot be conceded to the caloric.

The galvanic test is applicable to cases of suspected unilateral labyrinth suppuration with obstruction in the external canal where the caloric may fail us.

The galvanic test is an unilateral quantitative test of semicircular canal function which is a distinct advantage over the rotational test, which at best is a bilateral test.

The galvanic test is the only one we possess for testing the function of the eighth nerve in cases of neuritis or cases of secondary degeneration following destruction of the inner ear.

The galvanic test is the only one we possess whereby we can make a differential diagnosis between labyrinth destruction, pure and simple, and eighth nerve neuritis.

The galvanic test is the only test available for determining the progress of eighth nerve neuritis whether favorable or unfavorable.

Diagnosis of Labyrinthitis. The diagnosis of serous labyrinthitis is, according to H. B. Graham[6] made on the following symptoms: Succeeding an acute or chronic middle ear suppuration, or after an operation for the same, there ensue dizziness with or without vomiting; nystagmus to the sound side; the hearing is decreased to the perception of a shout or is lost entirely, the caloric and turning reactions are present or may be lost, the fistula symptom is present. In other words, we may, with the exception of the fistula symptom, have all the signs of a diffuse suppurative labyrinthitis and be unable to make a diagnosis. The life of the patient, and certainly his future ability to hear, may depend on the diagnosis; it becomes very important therefore, that a clear idea of the condition be acquired in order that the emergency may be met.

In those cases in which we can easily make a caloric test and find it present we have a clear path; but there are times when the placing of even sterile water in the ear after an operation is a dangerous procedure. The dura may have been lacerated or a sinus opened; there may be a fistula in the labyrinthine wall which is de-

(6) Laryngoscope, January, 1917.

pending on a fibrin covering for protection, and we may not care to break down the barriers against infections of the dura or labyrinth. Here we must depend entirely upon our clinical acumen to tell us when to open the labyrinth and sacrifice the patient's prospects for future hearing in order to save his life.

There are, then, two classes of cases where we must depend upon appearances to guide us to the most successful issue, namely: those cases in which a diagnosis may not be made in spite of our functional tests (deafness and non-reactive labyrinth), and secondly, those where it is inadvisable to make these tests. In either case we wait on the clinical course for guidance.

The dizziness and nystagmus have set in and the patient is lying on the sound side or is comfortable on either side, if he is not compelled to move. So long as there is not any headache, as long as the fever ranges between 98.6°, the pulse remains around normal, and there is no marked variation in the blood picture, we are pretty safe in letting the patient alone. But should the temperature and pulse rise rapidly, accompanied by a marked headache, and the dizziness take on a stormy character with vomiting, so that the patient is unwilling to be moved at all, the labyrinth must be sacrified and drainage established even as far as the internal canal.

One of the patients mentioned by Graham had had a discharge from the right ear all her life. Two months previous to her first visit she had had a polyp removed from the ear, and had been in bed for a couple of weeks following the removal of the polyp on account of dizziness and nausea. The dizziness and unsteady gait had remained, but in a less degree. Weber to the right. Rinne poor on the right (whisper and watch *nil;* spoken voice at four yards).

At operation a cholesteatomatous mass was removed from the antrum and attic; there was a fistula in the horizontal canal. Following the operation the patient was nauseated, dizzy, had a nystagmus to the left, was totally deaf, and the temperature was 100° F. In twelve hours the patient seemed to be somewhat more comfortable and therefore no effort was made to find out if the vestibular apparatus were intact. For the next three

days the temperature remained about 99° F., and the nausea and dizziness gradually subsided until on the seventh day the nystagmus and dizziness had disappeared and the patient left the hospital.

One week later, the patient, tested with the noise apparatus, was apparently deaf. The wound was granulating normally. Four months later the hearing was the same as before the operation, and two months later she could hear a whisper with the noise apparatus. Recovery was uneventful save for the fact that about four months after the operation, for a period of two weeks, there was a marked tenderness over the cerebellar region, with dizziness and errors in the pointing movements.

THE NOSE AND THROAT.

GEORGE E. SHAMBAUGH, M.D.

DISEASES OF THE NOSE AND THROAT.

GENERAL CONSIDERATIONS.

Diseases of the Throat, Nose and Ear, and Their Treatment in Hunter's Time. W. H. Kelson[1] believes that it may be interesting to recite a little history of the beginning of the specialty and to show what the men during the period of Hunter thought about the diseases of the ear, nose and throat.

Throat: One surgeon writes that the tonsils may be in an enlarged state, a condition in general termed a "Scirrhosity" of the tonsils, but this he thinks is not a good term, as except for their firmness there were no other characteristics of a scirrhus. In an inflammatory process the tonsils become swollen oftentimes to such an extent that swallowing and breathing are interfered with. There should be no hesitancy in operating in such a case. Removal with scapel and scissors was looked upon less favorably than removal with by the ligature. A soft silver wire was used through a double canula passed through the nose. The loop was tightened from time to time until the tonsil finally sloughed off. One tonsil was removed at a time.

"Sore throat with ulcers" appeared at this time in countries bordering upon the Mediterranean. In 1747 it appeared in England, being especially active in autumn and winter. It attacked children more than adults and appeared to be intensely infectious and contagious.

"The disease comes on with ague followed by great heat, great pain in head, heat and soreness in the throat, stiffness of the neck, purging and vomiting, and in-

(1) Lancet, June 24, 1916.

termittent sweating." The throat was intensely red throughout. "A broad patch, irregular in outline and of a pale, whitish color may be seen surrounded by a florid red." On the third day the process reached its acme. Free bleeding from the nose and throat may appear early. A foul odor to the breath with a thin bloody discharge.

Diseases of the Nose: Hemorrhage from the nose is usually of little consequence but may indeed be a serious matter.

Ozena is described as a name specially applied to foul ulcers of the nose discharging a fetid matter. The chief cause is cold, but external violence and irritating substances may also produce this condition.

Occlusion of the nostrils was occasionally encountered. The condition was attacked by setons or metal tubes left in place until final healing took place.

Nasal polypi, so-called after the "insect" of that name, were divided into two general classes, "the firm and soft ones." As regards the treatment the statement is made that the risk of removal is nearly in proportion to their firmness. A snare was used to best advantage in the removal, but there was a specially devised forceps that could be used for polypi far back in the nose.

Recent Developments in Rhinology and Laryngology. Speaking of the diagnosis of diseased tonsils, F. C. Todd[2] states that the usual indications are a deep redness of the peritonsillar area, a ready tendency of the tonsil to bleed on manipulation, the presence of a granulation-tissue type of tonsil, and cheesy masses in the crypts. As to removal of tonsils, any of the commonly used methods of dissection can be recommended, the main desideratum being total excision without damage to the surrounding tissues. He does not favor the Sluder method except in cases in which the tonsil projects well into the throat, is firm and not bound down by adhesions. In other cases it is likely to cause injury to the pillars. Damage to the posterior pillars which are connected with the vocal box may have a detrimental effect on the voice.

(2) Journal-Lancet, April 15, 1917.

Injury to the anterior pillar resulting in cicatricial contraction will impede the movements of the tongue and interfere to some extent with deglutition. Where such cicatrices exist and cause trouble, relief may be obtained by incising them under novocaine anesthesia, as the muscular retraction keeps the cut open and prevents reformation of the band. Todd contends that there is usually more hemorrhage following the Sluder than the snare operation. He advises against the use of adrenaline and recommends a thorough inspection of the wounds after the operation so that bleeding vessels may be picked up and tied. The bleeding point should be grasped in the longitudinal direction of the muscle fibers and the tissues transfixed with a long curved needle (similar to a hernia needle) and then tied off with catgut.

[It should be added that pus is not infrequently expressed from the tonsil. A tendency to recurring attacks of acute tonsillitis is an indication for removal, even when the tonsil between attacks appears quite normal. It has become apparent to most operators that the Sluder method is not the method of choice for a good many types of tonsils.—Ed.]

Todd uses a solution of iodine and alcohol in equal parts applied to the denuded area following the tonsillectomy. For general anesthesia he puts the patient in the recumbent position with face inverted by having the head tipped directly back over the edge of the table and supported by a nurse who sits on a low stool.

For the removal of adenoids he uses a sharp curette first, following with a dull side-scraping curette into the Rosenmüller fossae. If, on palpation the posterior ends of the inferior turbinates are found to be enlarged and projecting into the choanae, he cuts them away by turning this same dull-side curette into the postnasal orifices.

On the subject of nasal deformities and diseases the author describes the function of the turbinal bodies in filtering, warming, and moistening the inspired air, and explains how deformities lead to the so-called catarrhal conditions with tendency to frequent colds and sinus infections. Where the turbinates are affected as a result of a deflected septum it is a mistake to operate on them as the result is likely to be a dry scabby condition. The

septum, as the initial cause of the disturbance, must be thoroughly resected.

Polyps are no longer regarded as an entity, being in most cases but a manifestation of a sinus disease and their recurrence can be prevented only when the affected sinus is properly treated.

[The non-suppurative, hyperplastic form of ethmoiditis is the usual cause of nasal polypi, the presence of a suppurative sinus condition being but a secondary trouble.—Ed.]

Todd rejects nasal packing as unsurgical because it dams up secretions and prevents healing. After septal operations he recommends the use of a special clamp to keep the flaps together.

For the relief of acute sinusitis the use of cocaine and adrenaline is advocated to open the orifices of the sinuses and permit drainage which may be assisted also by the use of a suction apparatus.

The author describes an operation for opening the antrum where the incision is made just inside the vestibule of the nose along the line of union between the skin and mucous membrane in front of the inferior turbinate.

The bony angle is exposed and removed by chisel and forceps opening into the antrum whose nasal wall is then removed for an inch back, the nasal mucous membrane having previously been dissected up. The sinus is then cleaned out, a flap is made of the nasal mucosa which is turned down on to the floor of the antrum which can then drain directly into the anterior part of the nose.

The Relation of Tonsillar and Nasopharyngeal Infection to General Systemic Disorders. This sixty-three page monograph by S. J. Crowe, S. S. Watkins and A. S. Rothholz,[3] is based on a study of 1,000 cases of tonsils and adenoids operated on at Johns Hopkins Hospital during the past five years, and is a noteworthy contribution to the literature of tonsil disease. In a general way it is along the same lines as the work on focal infection which has been carried on in the Presbyterian Hospital of Chicago, under the direction of Dr. Frank

(3) Bull. Johns Hopkins Hosp., January, 1917.

Billings, with this difference, that the subject is approached more from the viewpoint of the nose and throat specialist, whereas the work in Chicago has had the advantage of being directed chiefly from the viewpoint of the internist, whose knowledge of the various systemic disorders caused by focal infection is necessarily more complete. It is gratifying to note in the Johns Hopkins Hospital the development of the spirit of coöperation between the men working in the several departments of medicine which has been such a conspicuous feature of the work carried out in the Presbyterian Hospital. This coöperation is the key to the successful solution of many of the problems in clinical medicine. The specialist in diseases of the nose and throat who assumes the responsibility of handling all the conditions of those patients who consult him for some local disorder, falls as far short of meeting the requirements of doing the best that can be done for his patients as does the internist who attempts to treat the eye, ear, nose and throat complications of patients.

This monograph includes a detailed discussion of the clinical anatomy of the nose, throat and lymphatic system of the neck. Emphasis is placed on the lymphatics of the neck, especially since the writers conclude that "palpable enlargement of the deep cervical lymphatic glands at the angle of the jaw" is always present when the tonsils are the seat of a chronic infection.

A chapter deals with "Focal Infection with Especial Reference to the Tonsil." In this the authors point out the interesting clinical fact that chronic foci of infection in the tonsils as well as elsewhere often exist without giving rise to local symptoms. The local evidence of tonsil infection can, as a rule, be detected either from the history of recurring attacks of tonsillitis or from examination of the tonsils themselves and the occurrence of palpable glands at the angle of the jaw. The menace from tonsils which have been partially removed, especially where the cautery has been used to scar the surface, is pointed out. Another important clinical fact emphasized is that "the tonsil is not the only portal of entry. Organisms probably pass through the mucous membrane of the nose and nasopharynx and pharynx

more frequently than is generally supposed.'' It is also pointed out that ''a tonsillectomy properly done is really a major surgical procedure and should not be undertaken unless the operator is thoroughly familiar with the principles and practices of the general rules of surgery.''

The fact is mentioned that ''the use of stock vaccines is unscientific and often dangerous.'' The extent to which the stock vaccines are being used in the treatment of infectious processes, especially by general practitioners in the country districts, is appalling when one appreciates the uselessness of such treatments.

A chapter is devoted to a discussion of the ''Portals of Entry of Tubercle Bacilli,'' with the conclusion that the tonsils and adenoids not infrequently act as the portals for tuberculous infection of the cervical glands. ''In view of these facts, and the anatomic relation of the lymphoid structures to the cervical glands, it seems to the authors that the tonsils and adenoids should be removed whenever there is any hyperplasia of the cervical glands that is not due to lues, new growths, or any of the blood diseases. They also exclude the group, especially frequent in children, where the hyperplasia of the cervical glands is a part of a general glandular enlargement.''

They give the indications for tonsillectomy as follows:

I. *Local disorders in the upper air passages:*
   1. Hyperplasia of the tonsils causing difficulty in swallowing, articulation, or breathing.
   2. Frequent tonsillitis or quinsy.
   3. Chronic laryngitis or bronchitis.
   4. Chronic catarrh or suppurative otitis media or an Eustachian tube affection.
   5. Chronic diphtheria carriers.
   6. Any of the various "reflex neuroses" in children, such as asthma, paroxysmal nocturnal attacks of coughing, enuresis, nocturna and sometimes convulsive seizures resembling petit mal.
   7. New growth.

II. *For local trouble in the cervical glands draining the tonsils:*
   1. Simple hyperplasia of the glands at the angle of the jaw.
   2. Tuberculous cervical adenitis.

III. *For general systemic disorders secondary to a focus of infection in the tonsils:*

1. Infectious arthritis in which the peri-articular changes predominate.
2. Myalgia or myositis.
3. The early stages of glomerulo-nephritis.
4. Various nervous symptoms designated as "neurasthenia."
5. Occasionally an iritis refractive to all treatment.
6. Rare conditions in which the chief symptoms are septic temperature, leukocytosis, general muscular and joint pains.

IV. *As a prophylactic measure:*
1. In chorea, acute rheumatic fever and heart lesions.
2. In cases of chronic nephritis and arteriosclerosis that give a history of repeated attacks of tonsillitis.

V. *As contra-indications for tonsillectomy are given:*
1. Tonsillectomy should never be done during the stage of acute tonsillitis because of the danger of cerebral abscess.
2. Diabetes.
3. Chronic deforming type of arthritis.
4. Acute stage of chorea, acute rheumatic fever or endocarditis.
5. As a general rule, tonsils should not be removed in children up to 15 years of age solely because they are enlarged or detritus seen in the crypts. Even frequent attacks of tonsillitis do not necessarily mean that the child's tonsils should be removed.
6. General anesthesia should not be given in cases of advanced or incipient tuberculosis.

[We can hardly concur in the conclusion that the tonsils should not be removed for the reasons given in paragraph V. In the first place, tonsils in children are not nearly so frequently the seat of cheesy concretions in the tonsil pockets as in adults and the presence of large, foul-smelling cheesy masses in the tonsils in childhood indicates a pathologic condition which in our opinion justifies tonsillectomy. In the second place, frequently recurring attacks of tonsillitis in childhood, even when the tonsils between attacks show no marked enlargement or other pathologic changes, justify tonsillectomy. Such attacks are a distinct menace to the health of the patient and the mere fact that the tonsils are the seat of frequently recurring acute inflammation justifies the conclusion that in children especially such tonsils are the seat of persistent foci of infection.—Ed.]

The technique of the operation is illustrated by a series of elaborate drawings. Dissection with a sharp

instrument is used for the complete operation. This differs from the usual method employed in loosening the tonsil by means of a sharp cutting instrument and its removal by means of a wire snare. The popular simple and efficient method of squeezing the tonsil through the fenestrum of a tonsillotome and its enucleation by the so-called Sluder technique is not apparently employed in the Johns Hopkins Hospital, even in cases in which this simplified technique is eminently suitable. Ligation of the bleeding vessels during operation is always done. The necessity for this has not arisen in the authors' own work, where the seizure of the vessel with artery forceps is all that has been found necessary to prevent bleeding, and much time is saved in performing the operation. They also vary the operation in adults, using local anesthesia rather than ether, as the method of choice, as they have found that the discomfort which the patient suffers from the operation and immediately after is very much less under a properly applied local anesthesia than when ether is used. An additional important reason for using local anesthesia in adults is that the risks incident to a general anesthesia are thus eliminated.

Under postoperative complications are included eighty-four cases of bleeding, two cases of postoperative pneumonia, four cases of acute otitis media, one case of acute laryngitis, two cases of acute bronchitis, two of suppurative cervical adenitis, three of postoperative elevation of temperature, which gradually subsided in ten days, three of tetany, one case of erysipelas and one of maxillary sinus infection.

Results in the several groups of cases are discussed, and interesting and elaborate tables of the 1,000 cases are included in this monograph.

The Mouth as a Factor in the Pathogenesis of Heart, Kidney and Joint Inflammations. Inflammation incited in the neighborhood of a tooth, says T. B. Hartzell,[4] leads to endarteritis with subsequent edema. The blocking of the return flow results in the deposition of lime salts on the tooth's root surface, and this, in turn, becomes a mechanical irritant and fosters bacterial growth.

(4) Journal-Lancet, April, 1916.

The teeth have a certain amount of motion in their sockets (known as a gomphosis joint) especially during mastication which further favors the inflammatory condition. Therefore, when an inflammatory condition is once set up it becomes continuous unless the condition is relieved by drawing the tooth or removing the calculus and smoothing the rough root surfaces. Naturally, drugs are useless as curative agents.

A second channel as the source of a focal infection is the infected dental-pulp canal. The relative importance of the dental path to other possible sources by which infection may enter into the circulation is illustrated by the fact that the total linear measurement of the gingival margin of a normal denture is thirty inches, covered or protected from view by the overlying gums.

That there are open channels leading from the bottom of the gum margin crevice into the surrounding tissue, is also dwelt upon by the author.

A devitalized tooth is a useful and safe unit if properly treated by the dentist.

[In chronic infections about the teeth, it is often found that the tonsils are also the seat of a chronic infection in which the same organisms are found to be the cause.—Ed.]

Diagnosis and Management of Vasomotor Disturbances of the Upper Air Passages. In a large proportion of vasomotor diseases of the upper respiratory tract, says J. L. Goodale,[5] the causal factor is the entrance of a foreign proteid into the system. The manner of entrance may be by contact with the mucous membrane directly or through the gastro-intestinal tract by ingestion. Furthermore, foreign proteids may be developed upon the mucous membranes through autolysis of pathogenic or saprophytic bacteria. The application of the skin test to these conditions is of diagnostic value when employed with a recognition of the phylogenetic relationships of animals and plants, as determined by serobiology. Protein material for testing should be prepared both from the sera and keratin of domestic animals, from the pollen of the chief plants causing hay-fever, and from various articles of food which enter

(5) Boston Med. and Surg. Jour., Aug. 10, 1916.

commonly into the diet. Bacterial proteids derived from the various invaders of the respiratory tract should be available either in solution or soluble form. The skin reactions having been determined, the management of the case will depend largely upon the relative preponderance of the local reaction in relation to the history. If the case is seasonal (hay-fever), treatment by injections is likely to be of service, but will usually have to be repeated annually. If the cause is due to inhalation and is perennial, then it is better to avoid the cause. If the proteid is found to enter the gastro-intestinal tract, tolerance may be gradually established by feeding the proteid in gradually increasing doses.

[Work along this line offers the most hopeful outlook for the solution of the hay-fever problem. We should not confuse work of this sort with the unscientific administration of drug-house vaccines.—Ed.]

Etiology of Common Colds. G. B. Foster, jr.,[6] refers to Kruse's experiment where he artificially produced colds in healthy individuals by inoculating them with a diluted nasal secretion taken from a patient with acute coryza. The secretion was diluted twenty times with normal saline, passed through a Berkefeld filter and a few drops of the filtrate dropped on the nasal mucosa of thirty-six individuals of whom 42 per cent. became ill with symptoms of coryza in from one to four days. Being unable to demonstrate bacteria in the filtrates Krause concluded that the causative organism was a filterable virus.

Foster obtained his filtrates in a similar manner to Kruse and found them sterile after culture tests. He inoculated ten healthy soldiers nine of whom developed acute coryza within from eight to thirty hours. He concluded with Kruse that the infective organism belongs to the class of filterable viruses similar to the organism of poliomyelitis and attempted to isolate this organism by inoculating tissue-ascitic fluid and tissue broth. He obtained uniform cultures which under the dark field microscope showed myriads of extremely active, minute bodies occurring singly, in pairs and in

(6) Jour. Amer. Med. Ass'n., April 15, 1916.

agglomerations of varying magnitude. They showed true motility, rather than brownian movement, of a to-and-fro progression or a tumbling movement. Efforts at staining these bodies with various known stains were fruitless of results. By filtering and diluting the filtrates of these cultures and inoculating eleven soldiers with a dilution approximately 1:90,000 of the original nasal secretion, he produced a coryza in every case.

As a result of these investigations, Foster believes that the transmission of colds takes place through "droplet infection," and that the infective agent is a filterable virus or organism which though not definitely recognizable as such, nevertheless must exist, and be capable of growth and multiplication, otherwise the extreme dilution of 1:90,000 could not possess pathogenicity.

[It seems very probable that the so-called common colds may be caused by several types of organisms, although the clinical symptoms in different cases may be very much alike.—Ed.]

Pains in the Head from the Standpoint of the Oral Surgeon. Pain and headache, according to J. L. Courier,[7] are not the same condition. Most pains in his opinion may be traced to the mouth and the ear. The fifth nerve because of its wide distribution is the usual seat of trouble. It is said this nerve represents the sensory roots of all motor cranial nerves, from the third to the twelfth inclusive. "An irritation in any branch of the sensory distribution of the fifth nerve may be the exciting cause of reflex pain in any other branch of the same nerve."

Gonorrheal Infection of the Upper Air Passages. J. Zange[8] says that inasmuch as there are few known instances of bacteriologically determined cases of gonorrheal infections of the nasal mucosa his case is especially interesting because the infection was traced from the conjunctival sac through the lachrymal duct from which the entire upper air passages, including the Eustachian tubes, were infected. The patient, a surgeon, was infected while opening a perineal abscess of gonorrheal

(7) New York Med. Jour., May 6, 1916.
(8) Zeitschr. f. Ohrenhlk., Vol. 73, No. 3.

origin, the pus squirting into his face. A few days later he developed severe conjunctivitis, difficulty in swallowing, rhinitis, and hoarseness. Under protargol treatment the symptoms abated in two weeks. The rapid resolution in this case may be attributed to the character of the mucosa in the region affected, the many layers of epithelium preventing the infection from penetrating into the submucosa.

The Upper Respiratory Mucous Membrane as a Key to Error in Metabolism. Stickle[9] discusses the influence of general metabolic changes on local conditions of the respiratory tract and cites three interesting cases.

A man of 43 who complained of headaches, nasal and dental pains, frequent colds, obstructed breathing, and nasal discharge was found upon examination to have an engorgement of the nasal mucosa extending down to the pharynx, fauces, larynx and trachea all of which retracted to nearly normal under stimulation. A thorough general examination led to the diagnosis of gastro-intestinal toxemia. Under proper metabolic treatment the whole condition cleared up promptly, the neuralgia disappeared and the respiratory mucosa retracted and maintained the normal position and function.

In the second patient, a man of 57, the symptoms were hoarseness of two months' duration, nasal obstruction and discharge. Local examination showed stasis and relaxation of nasal and pharyngeal mucosa, congestion of the arytenoids, infiltration of the false cords, swelling of the true cords with absence of movement in the left one. The general examination revealed slight cardiac hypertrophy, accentuation of the second aortic sound, weakness of the systoly at apex, tympanites, and distention. The *x*-ray showed enlargement of the tracheobronchial glands with some calcareous degeneration: blood-pressure 190, etc. No local treatment to the larynx was given, but after six months of attention to the cardiovascular and gastro-intestinal disturbances the laryngeal lesion cleared up completely. The vocal cords act normally and the respiratory mucosa is entirely restored to the normal.

The third patient was a young man of 33 who com-

(9) Ann. Otol., Rhinol. and Laryngol., December, 1916.

plained of cough and nasal obstruction with discharge; upon examination he showed a general stasis and engorgement of the mucous membranes of the nose, throat, and larynx. Further examination revealed tuberculosis in the lungs the toxemia of which was responsible for the local findings in the nose and throat. No local treatment was advised but the pulmonary lesion was attacked at once with resultant cure. Four years later the patient was in excellent condition with no nasal or pharyngeal trouble.

[It is very important that the nose and throat specialist keep in mind the relation of local disorders to general systemic conditions, and accustom himself to work in coöperation with the internist.—Ed.]

Calomel Fumigations in Treatment of Constitutional and Local Conditions. E. J. Brown[1] has modified his hot air apparatus described in the *Journal of the American Medical Association,* June, 1913, by substituting a Bunsen burner as a source of heat and introducing a three-inch section of iron tubing, a half-inch bore, to admit a small phial for the calomel. By a reducer, six inches of quarter-inch tubing is connected with the tube containing the calomel, and the latter by a short rubber tube connected with a conical nasal tube of glass, or the fumes may be thrown directly into a large glass tube held in the mouth. The nose-piece is less irritating than the mouth glass and if a minimum of air is used irritation is avoided and efficient doses may be administered in sittings of from ten to thirty minutes. Brown finds that with his apparatus 15 grains of calomel can be vaporized in forty-five minutes.

Among the cases treated which yielded excellent results by this method were specific iritis and periostitis of the superior maxilla, ethmoiditis and antral suppuration (a 25 per cent. calomel-kaolin powder by insufflation was also used in these cases), blepharitis, and subglottic infiltration of probable specific nature.

In sinus diseases, the author reports excellent results with his apparatus by using alternating negative and positive pressures to evacuate the sinuses and inflate the calomel vapor. Also, he recommends a 5 per cent. calo-

(1) Laryngoscope, March, 1917.

mel-kaolin powder for the patient to use at home following an alkaline wash.

Clinical Experience with Vaccines in Diseases of the Ear, Nose, and Throat. Regarding the use of vaccines as a prophylactic against common colds, G. M. Coates[2] states that their value consists in developing an immunity to certain organisms whereby mixed infections are prevented, the interim between colds lengthened, and the attacks themselves very much shortened. An autogenous vaccine made during an attack is likely to be more efficacious in preventing subsequent attacks than stock vaccines. By preventing frequent colds the ears are at the same time being protected from recurrent catarrhal changes and will yield more readily to appropriate treatment.

The use of vaccines in diseases of the accessory sinuses is not accompanied by brilliant results. Nevertheless they have a field of usefulness in such cases as tend to become chronic despite good drainage. Also, vaccines in such cases are likely to prevent re-infections.

In ozena the reports of Hofer, Kofler, Skillern, and Horn, using a polyvalent vaccine prepared from the *Coccobacillus fetidus* of Perez, are encouraging and offer a field for further investigation.*

Babcock reports good results from the use of an autogenous vaccine in essential asthma. Believing this trouble to be an anaphylactic reaction to some foreign protein he first searches for the focus of absorption, eradicates it, and then uses the vaccine which is prepared from the bronchial sputum. He finds that in addition to the usual organisms of bronchitis there is an anaërobic germ which he can not classify, but he believes to be of etiologic significance and which he includes in the vaccine.

[The administration of stock vaccines as a prophylactic measure against cold is apparently being carried out quite extensively in certain parts of the country. Such a procedure is hardly in accord with scientific treatment of disease.—Ed.]

(2) Jour. Amer. Med. Ass'n., Jan. 20, 1917.

(*) Horn's work and also the report by McKenzie of his work with tuberculin in ozena cases are reported in this volume, pages 277 and 285.

Action of Nasal Secretion on the Growth of the Meningococcus. C. Shearer[3] accidentally discovered that smears taken from the nasal mucosa for the meningococcus seemed to grow more rapidly when accompanied by a larger amount of nasal secretion. In order to determine whether there was a food factor in the secretion which acts as an accessory to the growth of this and other germs he conducted a number of experiments with various extracts of nasal secretions, aqueous, alcoholic, and ethereal. These were mixed in various dilutions with 5 c.c. of a standard meningococcus growth and the resultant cultures studied for rapidity and luxuriance of growth. Similar experiments were made with the *Bacillus typhosus, Streptococcus zymogenes, Micrococcus pharyngeus flavus,* pneumococcus, and *B. coli communis.* His conclusions are that there is some body in the nasal secretion which greatly accelerates the growth of the meningococcus on artificial culture media. "Alone it is incapable of acting as a food or stimulant to the growth of this germ. It is soluble in water, less so in alcohol, and very insoluble in ether. It has great heat-resisting power, being able to resist prolonged boiling for many hours. It is not destroyed by boiling in the presence of strong hydrochloric acid for twelve hours. In addition to the meningococcus it also stimulates the growth of many other pathogenic germs."

Importance of Examination and Treatment of Nasopharynx in Epidemic Meningitis. Rosenthal and Cheville[4] assert that in the incipiency of epidemic meningitis the adenoid is found to be abnormally hard and the examination of smears taken from the organ at this time shows diplococci and associated bacteria with the characteristic debris of blood corpuscles, the polynuclears predominating and very much altered, Gram-negative diplococci both intracellular and extracellular and a few epithelial cells. If the smear shows numerous epithelial cells and Gram-positive diplococci the probability of epidemic meningitis is slight. So long as the findings are of this characteristic type there can be no question of convalescence even though the symp-

(3) Lancet, Jan. 13, 1917.
(4) Paris Méd., June 24, 1916.

toms may have subsided. The pseudo-convalescent is still a menace to himself and the community. The nasopharynx should be treated with the specific serum as well as the meninges. The authors for this purpose use an injection through the nostrils of a medicated oil mixed with equal parts of antimeningococcus serum. The meningococcus adenoiditis, they claim, is the primitive lesion, the fundamental, initial and terminal, substratum of infection with the meningococcus. So long as it persists the patient is infected, not merely a carrier, and specific treatment of the nasopharynx is necessary.

The After-Effects of Diphtheria on the Eye, Nose, and Throat. Gayland Hall[5] says that in nasal diphtheria there is the characteristic membrane and discharges, with or without systemic disturbance or pronounced toxemia—the higher the membrane growing in the nose or nasopharynx, the more virulent the infection. Atrophic rhinitis is a sequel and is now treated by vaccines. The patient is frequently a carrier.

Infection of the middle-ear occurs but not so frequently as in measles, scarlet fever, etc.

The Rhinologist and Hypophyseal Surgery. The hypophysis occupies a bony cavity with little room to spare. By enlarging through disease it encroaches on other structures as soon as it overrides the capacity of the sella. As a result, says Landon,[6] there may be pressure on the third ventricle causing hydrocephalus, pressure on the optic chiasm leading to contraction of the visual fields for color and form, leading eventually to blindness, pressure on the third, fourth or sixth nerves causing various paralyses of the ocular muscles, pressure on the cavernous sinus producing exophthalmos, headache, and photophobia. No operation has yet been successful in removing the tumor entirely but various procedures have been devised which have met with more or less success in removing a portion of the mass, or at least relieving pressure.

The intracranial methods Landon considers very dangerous because of the large opening necessary and the

(5) Kentucky State Med. Jour., August, 1916.
(6) Penn. Med. Jour., June, 1916.

intimate relationship of the vital structures lying in the path of the surgeon. The dura being absent below the gland and to some extent on its sides and the sella dipping into the sphenoid sinus to a greater or less degree makes the approach from below more feasible than from above. The author recommends Hirsch's intranasal operation, having performed it himself in fifteen cases. His results were satisfactory; only one patient with visual symptoms failed to show improvement. In five patients the headache, mental torpor and increased weight were greatly diminished. In one case of acromegaly, although the disease was arrested, headache and photophobia persisted despite two operations. There were three deaths which the author considers a very low mortality compared to other methods. Two of these were malignant cases and the third patient developed a streptococcus meningitis following coryza during convalescence.

Landon believes that most of these cases being benign, all that is necessary is to expose the mass thus allowing decompression, incising it if it be a cyst, or at most removing a fragment if it be a tumor. Any attempt to disturb the gland further is likely to be fatal.

Hemorrhages in Operations on the Nose and Throat. Quinlan[7] groups the various causes of hemorrhage following operations on the nose and throat under two heads, local and general. Among the local causes detailed are the following: (1) Faulty technique; (2) anomalous situation of blood-vessels; (3) local inflammatory processes or areas of congestion.

The general causes mentioned are hemophilia, purpura, leukemia, and exophthalmic goiter.

[High blood-pressure is a common general cause of hemorrhage from the nose and throat.—Ed.]

For the control of nasal hemorrhage the author recommends the following: (1) Pinching the alae and holding the head forward; (2) local injections of warm liquid gelatine (20 to 30 c.c.); (3) Yankauer's suture of the posterior end of the inferior turbinate; (4) anterior pack; (5) posterior pack.

For tonsillar hemorrhage he recommends the following

(7) Med. Record, April, 1916.

measures: (1) Complete rest, mental and physical; (2) compression with a wad of gauze or cotton soaked in peroxide or antipyrin; (3) tonsil clamp; (4) approximating the pillars with clamps, over a wad or tampon; (5) suturing the pillars; (6) ligation of the common carotid.

[The hypodermic administration of morphine is often of great value in controlling bleeding, especially after a tonsil operation in adults.—Ed.]

In addition, an injection of serum may be given intravenously, using from 20 to 40 c.c. and repeating one-half that dose within from two to six hours if necessary. Or pituitrin 1 c.c. hypodermically may be given. Internally calcium lactate in 15 or 20 grain doses is recommended.

Use of Vaccines in Infectious Diseases of the Ear, Nose and Throat. R. E. Moss[8] says that the diseases that are amenable to vaccine therapy would include all the acute and chronic catarrhs affecting the accessory sinuses, Eustachian tubes, middle ear, mastoid, throat and lungs. When one considers the number of people afflicted each season with these diseases, the time lost, the complications that often become chronic and the deaths that result, one is impressed with their importance and the responsibility resting on the medical profession.

In former years it was the author's custom to diagnose these cases as colds or grip, depending on the mildness or severity of the symptoms. Cases of the mild type are due to the *B. septicus*, and affect the nose and throat only, while the severer types are due to one or more of the more malignant germs. It has been proved that one epidemic may be due to the influenza bacillus, another to the staphylococcus and the streptococcus, and still others to the pneumococcus, and so on.

To obtain satisfactory results, therefore, it is necessary to find what germ or germs is the active cause, and then a reliable autogenous vaccine can be made with some definite idea of what to expect from its use. Therapeutic measures of known or proven value should be used and strict attention given to diet, hygiene, etc.

The initial dose of vaccine in a given case is largely

(8) Texas State Journal of Medicine, April, 1916.

empirical and depends upon the patient; that is, the age, physical condition and the microörganisms present. Allen says, that in the first few days of an attack the following doses would be safe to begin with, *B. septicus,* 50 million; *M. catarrhalis,* 2 million; *M. paratetragenus,* 25 million; pneumococcus, 25 million; influenza bacillus, 50 million; bacillus of Friedländer, 50 million.

If a given dose in acute cases causes no reaction, it may be assumed at once that it was too small, and the dose rapidly increased until the fever goes up from one to two degrees. This should be followed in from twelve to twenty-four hours with a fall in the temperature, below that which it was before the dose was given, and general improvement with increased appetite. The frequency of repetition depends largely upon how the patient reacts following each dose, and varies from two to eight or ten days. Whether the dose should be increased or not depends entirely upon the local or systemic reaction.

In chronic cases, the doses are much larger because the effects are less positive than in acute cases. In chronic sinusitis and empyema of the accessory nasal cavities, it is necessary, as a rule, to resort to surgical measures and daily lavage. The absorption of poisons or toxins in these cases has so lowered their resistance that patience and ingenuity will often be taxed to the utmost before obtaining favorable results.

The effects, in some cases are truly magical, while in others they are very disappointing. These disappointments, as a rule, are due to some new germ invading the tissues, and therefore repeated examinations of the secretions and the preparation of fresh vaccine are required.

DISEASES OF THE NOSE.

The Correlative Action of the Pharynx and Soft Palate and its Effect Upon Post-Nasal Diagnosis. Using thin bismuth paste or a colored fluid placed through the nostril or the posterior surface of the soft palate, G. Sluder[1] has studied the effect of swallowing

(1) Ann. Otol., March, 1916.

and gagging upon pus in the nasopharynx. He believes that in a small nasopharynx the location of pus as seen by posterior rhinoscopy is of little definite value so far as telling the original source of the pus is concerned; because, in the act of swallowing or gagging, the position of the pus is changed by the rubbing of the surfaces in the action of the soft palate.

Nasopharyngeal Hemorrhage. This important question is thoroughly discussed by J. Weinstein,[2] particularly in regard to the causes of hemorrhage and the essentials necessary to its control. The commonly accepted causes of hemorrhage being high blood-pressure, persistent vasodilatation, and delayed blood clotting the therapeutic measures are of three kinds:

1. Those equalizing circulation in order to lessen the intravascular pressure at the bleeding point.
2. Those contracting the vessel itself.
3. Those decreasing the coagulation time of the blood.

The last mentioned has been the subject of some fruitful investigation. It has been established that clotting takes place through the action of thrombin on fibrinogen, the origin of the thrombin, however, being still a subject of controversy; normally clotting is prevented in the blood by antithrombin which is supposed to be formed in the liver. The liver plays an important part in coagulation, providing the intestines and adrenals with the necessary elements to hasten clotting after extensive bleeding. On the other hand, injections of adrenaline also hasten clotting thus seeming to stimulate the liver and intestines to secrete more of the coagulation elements.

Chloroform and ether seem to decrease the amount of antithrombin and thus aid coagulation.

The author, using hypodermic injections of emetine as a routine procedure prior to tonsillectomies, found a reduction in coagulation time of one-third, as confirmed by Duke's coagulometer. He has also used pituitrin with equally good results. Coagulen ciba, discovered by Fonio was used in 700 cases with excellent results. Kauch also used it in 300 cases with uniform shortening of coagulation time.

(2) Laryngoscope, March, 1917.

Cronin of New York reports the use of thromboplastin in 2,036 tonsillectomies without a single postoperative bleeding and reports that it shortens the coagulation time.

Coagulose and horse serum have also been used with favorable results.

The local hemostatic measures in cases of postoperative hemorrhage from the tonsils and lateral pharyngeal wall are given in this order: (1) application of Mikulicz's forceps; (2) compression of the common carotid; (3) ligation of the common carotid or its branches.

[In many cases, especially in adults and where the bleeding point can be detected, the quickest as well as the least annoying method of controlling bleeding is to seize the bleeding point with a curved artery forceps.—Ed.]

Atrophic Rhinitis and Tuberculosis. McKenzie[3] was able to determine a relationship between tuberculosis and ozena. In 68 per cent. of autopsies performed on patients who had suffered with ozena he found tuberculous changes in the lungs. Clinical examination of ozena patients showed from 20 to 58 per cent. with manifest tuberculous history in the family. In 80 per cent. of the ozena patients under the age of 15 the v. Pirquet test was positive; the subcutaneous tuberculin reaction was positive in 34 per cent. The author in conjunction with Mackeith treated thirteen patients with tuberculin. In seven there was a marked improvement, in three a moderate improvement, and in two improvement followed by relapse. One case was uninfluenced. The author considers "improvement" to mean disappearance of fetor, loss or pronounced diminishing of the crust formation, and finally a subsidence of the discharge. He believes the acid-fast bacillus found in the crusts to be a variation of the tubercle bacillus and that ozena should be considered as a paratuberculous manifestation similar to lupus erythematosus and phlyctenular conjunctivitis.

Conservative Nasal Surgery. O. Tydings[4] says that a nose should be studied with regard to respiration,

(3) Jour. Laryngol., Rhinol., and Otol., Vol. 31, No. 5.
(4) Bull. Chicago Med. Soc., Oct. 28, 1916.

ventilation and olfaction, and only after such a study should surgical procedure be undertaken. The patients are seldom seen until the condition has become intolerable. Many obstructions in the nose are dependent upon systemic conditions which must be carefully investigated and corrected; these are systemic taint, inherited or acquired, such as syphilis, tuberculosis, chlorosis, or a general fibrosis unquestionably of systemic origin, and relievable only by attention to the bodily taint. Too much stress can not be laid upon this phase of treatment. In the study of obstructive conditions due to local causes, the throat and postnasal space should be carefully considered. Obstructions due to hypertrophied tonsils and adenoids should be eliminated. Many soft hypertrophies in the nose will subside when ventilation and respiration have been established. Tydings cited two cases in which operations had failed to give relief, by reason of neglect of the foregoing considerations. A frequent and serious offense against conservative surgery is the removal of the inferior turbinate upon the side of the convexity of a deflected septum. He is at a loss to account for the frequency of this operation. Permanent relief is only obtained by replacing the septum where it belongs and leaving the inferior turbinal alone. The structure and function of the bony portion of the turbinates should be remembered. Another insult to the inferior turbinate is the removal of the anterior part preliminary to operation to relieve a suppurating antrum. For this, the removal of any part of it is superfluous. An opening can be made under the inferior turbinate without removing the anterior portion. To make a septum straight, it may be necessary to remove the redundant tissue from the middle or inferior turbinate upon the opposite side, but obstruction lower down in the respiratory tract, either adenoids or diseased tonsils, must be considered, and attended to. While a middle turbinate may be hypertrophied and in need of attention, seldom is it necessary to remove it *in toto*, as is often done for obstruction due to chronic sinusitis. The sinus should be opened up and drained. A much neglected sinus is the sphenoid. This should not be ignored. Many postnasal disturbances can be cured

only by free drainage. The treatment needed is ventilation and occasional drainage, and not the obliteration of the entire mucosa.

The author acknowledged the indebtedness of humanity to those who have developed the technique of drainage of the frontal sinuses by enlarging the frontnasal duct. No operation upon the nose is justifiable for the relief of headache until the question of possible eye conditions as a factor has been removed.

Cessation of Vertiginous Attacks Following Intranasal Treatment. Four cases of vertigo and tinnitis coming on rather suddenly and of some years standing are reported by R. Fullerton.[5] Examination showed a chronic catarrhal condition of the middle ear with some middle ear deafness. In each case, intranasal examination revealed a chronic hypertrophic rhinitis, with some hyperplasia. When this was relieved the vertiginous attacks disappeared promptly.

[This report is interesting and worth while and other observers could confirm it.—Ed.]

Epidemic Poliomyelitis in its Nasopharyngeal Aspects. W. S. Bryant[6] says:

"It should be emphasized that during epidemic poliomyelitis, the significance of nasopharyngitis is enormously enhanced." Bryant had observed in a previous epidemic (1910) that all patients had nasopharyngitis of varying degrees of severity; also that those associated with the manifest cases had the same condition, and he believed these had poliomyelitis in varying degree.

He advises proper treatment, such as cleansing measures, in all cases and in persons exposed.

Migraine. True migraine, says Antonio H. Molina-de Saint Remy,[7] is caused by the swelling of the erectile tissue over the middle turbinate and a deviated septum causing a contact which results in pressure on the sphenopalatine ganglion.

The treatment in a well-defined case is a complete septum operation thus removing all contacts. Swelling occurs later but the resistance of a fixed surface *e. g.*,

(5) Glasgow Med. Jour., November, 1916.
(6) New York Med. Jour., Oct. 14, 1916.
(7) New York Med. Jour., March 25, 1916.

deviated septum, is not encountered so that the swelling tends to subside physiologically. Treatment of the turbinates never has given the same results.

[The abstractor has had similar experience in a number of cases. Many men scoff at the idea of headache due to anything in the nose other than a closed empyema; however, such experience by men sufficiently trained tends to prove the contention that headaches due to contact points between the septum and middle turbinates are not infrequent. If the patient will present himself while suffering with a headache and the contact is seen and reduced with cocaine or argyrol, and this is followed by disappearance of the headache, it would seem that that would be sufficient evidence, especially if the procedure were carried out more than once with the same result. Recently, two patients have been seen in whom both middle turbinates had been previously removed with temporary relief. Following a septum resection (five months) there has been no complaint. Probably a periostitis had been set up or the nerve involved in the turbinate scar.—Ed.]

Sarcoma of the Nasopharynx Healed by Mesothorium. Siebenmann's[8] case occurred in a boy of 16 who had noticed the growth for three years. It was at first seen only in the nose and was diagnosed as a fibrolymphangioma. Following operation there was rapid recurrence, filling up the antrum of Highmore, and causing partial destruction of the sphenoid. The dura was exposed and could be touched. The anatomic diagnosis was sarcoma. The whole nasopharynx was filled with the mass and there was necrosis of the walls, pain, fever, severe hemorrhages, cachexia, and absorption of the soft palate. The treatment consisted of the introduction of a silver tube containing 53.5 mg. of mesothorium, the tube being wrapped in cotton and rubber tissue which was placed in the retronasal space and left *in situ* for 48 hours on two occasions, once at the end of December and again during the early part of January. By the middle of March, the process was brought to a standstill, and the entire growth disappeared.

(8) Cor.-Bl. f. schweiz. Aerzte, No. 37, 1916.

Another similar case was reported with equally good results. The author states that mesothorium has little or no influence over carcinoma, but it was found to be very efficacious in a case of rapidly developing tuberculosis of the nasopharynx.

Case of Hypernephroma Metastasis in the Nasal Cavity. The case reported by Storath[9] was that of a man of 58, who had a tumor in the right half of the nose, which was operated on several times including the radical Denker method, but with persistent recurrences. The microscopic diagnosis of the tumor masses was "granuloma," "carcinoma," "periepithelioma," and, finally hypernephroma. The right kidney was found enlarged and the *x*-ray showed numerous lung metastases.

There were severe hemorrhages from the tumor, followed by anemia and cachexia. Death took place two months from the time the case was first observed. Autopsy revealed the tumor of the right kidney and metastases in the left kidney, mediastinal and peribronchial glands and the nose. The latter had the typical structure of a hypernephroma.

A noteworthy symptom was pulsation of the tumor as observed in the residine following the Denker operation. The author insists that one should think of hypernephroma when confronted with a malignant tumor of the nose where, in addition to the usual symptoms of carcinoma, hemorrhages predominate in the clinical picture and there is pulsation. He believes that the tumor should be radically removed only when it exists as a solitary metastasis, the general condition of the patient is good and the primary focus is operable at the same sitting. His radical operation in this as in other malignancies of the nose embraces a resection of the upper jaw with exenteration of the ethmoid cells when the tumor is in the lower plane of the nose, or a complete removal of all structures up to the dura of the anterior cranial fossa, if the tumor is situated in the upper level of the nose.

Gumma of the Nose. Gumma within the nose is a rare condition compared to the usual luetic lesions found in this locality, namely the deep ulceration or broken-

(9) Zeitschr. f. Ohrenhlk., Vol. 69, p. 157.

down necrosis. T. J. Harris[1] reports a case in which the gumma had existed for over a year and the diagnosis was not made until after the mass was removed and examined at the laboratory. He says: "Its appearance is so characteristic that only its apparent innocence can explain a failure to make the diagnosis." It usually presents itself as a uniformly smooth enlargement on the inferior turbinate or septum, covered over by apparently normal mucous membrane. It differs from simple hypertrophy in that neither cocaine and adrenaline nor pressure cause any reduction in size. It is not accompanied by any marked pain. When it occurs on the septum it may be differentiated from a deflection by the absence of a corresponding concavity on the other side, from a chondroma or osteoma by the difference in density and from a sarcoma by the absence of any tendency to bleed. The diagnosis between gumma and a tuberculous swelling may at times be difficult, especially when the tuberculous lesion is primary. The latter, however, shows a tendency to early ulceration presenting then the characteristics of a tuberculous lesion; also its color is usually paler than that of a gumma.

Rhinophyma. Milligan[2] presents a case of rhinophyma in a man of 58 that had existed for years. There was a prior history of acne rosacea; the man was not a heavy drinker, indulging occasionally in beer. The nose presented the characteristic large lobulated appearance with prominent openings of the sebaceous glands and a quantity of sebum on the skin.

The operation was as follows: An incision was made down the dorsum of the nose, and two lateral incisions round the side of the nose, and partly with a very sharp knife and partly with a very sharp razor all the lobulated and hypertrophied tissue was stripped off the nose, care being taken not to injure the cartilages. During the dissection, the nose was kept packed with cotton to keep it distended. The raw surface was covered over with a skin graft taken from the patient's leg. The graft was then protected by gold leaf and a plaster

(1) Amer. Jour. Syphilis, January, 1917.
(2) Jour. Laryngol., Rhinol., and Otol., July, 1916.

dressing applied which was left for five days. The result was perfect.

The histologic examination of the excised tissue showed marked thickening in the subcutaneous tissue with deposits of fat. There was an interstitial hyperplastic enlargement of the blood-vessels and lymphatics. The sebaceous glands were enlarged to five times their normal size and increased in number.

Hay-Fever. At the outset, Scheppergrell[3] dispels several erroneous impressions regarding this disease: first, that farmers who are most exposed to the pollens seldom suffer from hay-fever; second, that the colored population are relatively immune; third, that the disease is uncommon below the thirty-fifth parallel. These have been disproved by statistics.

The development of hay-fever in any locality depends on the atmospheric hay-fever pollens increasing to a point which overcomes the resistance of the patient. Most of the spring and summer cases are caused by the pollen of the grasses (*Graminae*); to a less extent by the yellow dock (*Rumex crispus*), amaranth (*Amaranthus spinosus*), and goose foot (*Chenopodium anthelminticum*). Hay-fever due to the grass pollen is less severe then that due to ragweed and is easier to prevent. Being twenty times as large as the latter, grass pollen is not carried so far by the wind and rarely remains long in the atmosphere.

The autumnal type which is due to the ragweed pollen developed in the city of New Orleans about August 20, the weed having begun to pollinate about ten to twenty days previously.

The pollen count on exposed pollen plates was 7 per cent. on August 20. The next day the wind rose to a velocity of twenty-three miles an hour and the pollen count increased to 87 per cent. being simultaneous with the development of hay-fever in a large percentage of the patients.

The buoyancy of this pollen was illustrated by the fact that the common ragweed does not grow within five miles of the residential section of New Orleans. The etiologic significance in hay-fever was further corrob-

(3) New York Med. Jour., Dec. 9, 1916.

orated by the disappearance of the disease on October 16, at which date the pollen had fallen to a 1 or 2 per cent. count on the exposed plates.

As a result of an investigation by the U. S. Public Health service in Louisiana, it was determined that 1 per cent. of the total population suffered from hay-fever.

Altitude does not preclude the existence of this disease, it having been observed in the Allegheny range up to an altitude of 5,000 feet. The ragweed is found even at this height in the section east of Kansas. In the Rocky Mountain and Pacific states, where ragweed is rare, the sage wormwood is found at altitudes as great as 6,000 feet and is a common cause of hay-fever.

Ragweed is most prevalent in sections that have been cultivated; therefore, hay-fever is uncommon where there are extensive forests. This accounts for the lower percentage of hay-fever in some of the western states.

Autumnal hay-fever is more common than the spring type, the proportion varying in different parts of the country from 65 to 80 per cent. On the coast the earlier form predominates because of the comparative infrequence of the ragweed.

The disease is most frequent between the ages of 20 and 40 (62 per cent.), the next most frequent period being between 10 and 20 years (17 per cent.). As to occupation, the Louisiana statistics show that farmers comprise 38 per cent. of all cases. Persons with indoor occupations form 29 per cent. and those with outdoor callings 19 per cent. of all cases. Males are more susceptible than females (63 per cent). The colored race is about one-third as susceptible as the white according to the same statistics.

Studies of the Perez Bacillus in Ozena. J. L. Burckhardt and E. Oppikofer[4] state that Perez was able to isolate a bacillus from the nasal secretion in ozena which he named "*Coccobacillus foetidus ozenae*" and which he could show only in cases of true ozena and never in the normal nose. Similarly, this bacillus was found in the dog, and on the basis of this finding which was further supported by animal experimentation and on the basis of case histories which showed that every case of ozena

(4) Arch. f. Laryngol. and Rhinol., Vol. 30, No. 1.

originated from another case, or from a canine source, and finally from the results of vaccine therapy Perez assumed that ozena is an infectious process.

The authors believed, from their knowledge of the pathology of ozena, that it was necessary to corroborate these researches and employed for that purpose two strains of the Perez bacillus which were placed at their disposal. Their experiments were carried out on guinea-pigs.

Their results do not coincide with those of Perez nor vith similar experiments of Hofer and others, therefore hey conclude that the specific rôle of the Perez bacillus is rather doubtful. They could not produce experimentally a chronic rhinitis or atrophy of the nasal mucosa. They believe that the Perez bacillus can be designated at most as merely a similar bacillus to the Abel-Lowenberg ozena bacterium whose significance also is doubted by many.

Ozena: Etiology and Treatment. Horn and Victors[5] selected forty-nine cases of true clinical ozena for special study. In thirty-seven of these the coccobacillus was isolated. In the remaining cases they found either the Abel bacillus or some member of the Friedlander group. They noted that in certain instances of apparent Abel bacillus infection the Perez bacillus was isolated after the vaccine had been administered. In isolating the organism they advise taking the culture from the anterior end of the middle turbinate after the removal of crusts.

For treatment they used a polyvalent vaccine, sustaining the virulence of the germ and insuring fresh bacterial suspensions by a routine procedure of animal passage, recovery, and suspension, so that a fresh potent vaccine was available every three or four weeks. The initial dose was 125,000,000, which was increased 100,000,000 every third or fourth day until a reaction was obtained. Upon reaching the dose of intolerance the interim between injections was increased to five or ten days and the dose augmented to ultimately one to two billion. They obtained remarkable improvement in a large number of cases, several being entirely cured.

(5) New York Med. Jour., Dec. 2, 1916.

One serious difficulty encountered was a tendency to relapse after treatment had been suspended.

Their conclusions are as follows:

"Certain characteristics of *Coccobacillus foetidus ozenae* (Perez) have been heretofore described erroneously, in that the organism is motile, frequently ferments certain carbohydrates, and may produce an acid.

"*Coccobacillus foetidus ozenae* is the bacterial factor in the etiology of true clinical ozenae.

"The Abels and other organisms of the Friedlander type play no part in the etiology of true ozena and are purely saprophytic.

"The coccobacillus of ozena is made up of many subvarieties or strains.

"*Coccobacillus foetidus ozenae* and *Bacillus bronchisepticus*, the specific organism of canine distemper, are strikingly similar organisms.

"Coccobacillus of ozena and *Bacillus bronchisepticus* should be grouped together.

"A change in the name of the organism of ozena from *Coccobacillus foetidus ozenae* to *Bacillus rhinosepticus* is proposed.

"Vaccine therapy is the most promising of all methods in the treatment of fetid ozena yet suggested. Its value and limitations are similar to those of vaccine therapy in general in combating chronic local infections."

The Septum.

Deformities of the Nasal Septum and Their Correction by an Improved Technique for Submucous Resection. J. L. Maybaum[6] says:

"In general, three well-defined indications for performing a submucous resection upon a pathologically deformed septum are recognizable, each pointing to a rather distinct type of deformity. The general indications are defective breathing, defective drainage, and reflex symptoms from pressure upon or from adjacent structures: one or more of these indications may be present." All other causes should have been eliminated.

In the pre-operative preparation of the patient, May-

(6) Amer. Jour. Surg., August, 1916.

baum uses a hypodermatic injection of morphine sulphate and atropine one-half hour before operation. For two years he has used the reclining position with head slightly elevated and has found it more satisfactory in that fewer interruptions occur because of fainting, etc. Particular attention is paid to the cleansing of the introitus, tincture of iodine is used. Gauze packing is used as a rule, but occasionally no packing with an incision posteriorly allowing for drainage. Strict avoidance of any manipulation for three days after hastens the convalescence, Maybaum believes, and that is his practice. Administration of pyramidon gr. v and caffeine gr. ½, repeated once in four hours, controls the headache.

[The abstractor has had a rather large experience with septum and intranasal operative procedures and can not agree with Maybaum's statement that hypertrophy of the inferior turbinate on the concave side is "Nature's attempt to fill in the abnormally large space," but believes it to be the same compensatory hypertrophy which occurs in heart muscle, the result of overwork or carrying the "overload," *i. e.*, function of the obstructed side. "Too much space" intranasally is a catch all and should be used more guardedly. It is a well-known observation that this same "compensatory hypertrophy" becomes later an atrophy and then it certainly does not fill up "too much space." The same pathologic sequences take place in the nose as elsewhere in the body.

The question of position for the patient is a matter of personal preference with the operator. That the anxiety of the patient is responsible for most of the untoward symptoms the patient may have, I am firmly convinced. It is my custom to continue operating even though the patient does "faint." The patient immediately after completing the operation seems to have had no bad effects. One frequently sees this "fainting," etc., before any cocaine has been used, so it can not be said all to be due to the cocaine.—Ed.]

Nasal Septum Clamp or Splint to be Used After Submucous Resections in Place of Packing. The instrument here illustrated has been used with success by F. C. Todd[7] in his septum cases. It is claimed that the

(7) Jour. Amer. Med. Ass'n., April 29, 1916.

discomfort of the nasal packing or tampon is done away with. It is left in place two days.

[The danger of mechanical contrivances by packing is the pressure necrosis. Some surgeons use no packing

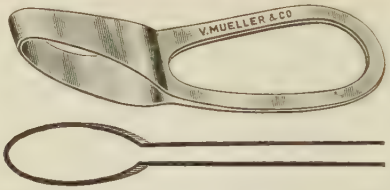


Fig. 54. Nasal septum clamp or splint.

in selected cases, but in my opinion a small pack placed high with loose packing below has in my experience been more successful and is not particularly uncomfortable. —Ed.]

Xanthosis and Other Septal Hemorrhages. The most frequent cause of septal hemorrhage, says C. C. Cott,[8] is that condition called xanthosis and described by Watson Williams as a "yellowish pigmentation of the pituitary membrane as the result of interstitial hemorrhage." The anterior portion of the septum is most frequently affected.

The symptoms are not especially characteristic. Examination reveals a yellowish spot the size of a dime on the septum about half an inch from the anterior nares. It appears as frequently on straight septa as on those deviated. There may be steady oozing or there may be a well-marked pulsating hemorrhage.

In the treatment Cott says that packing, cautery, etc., are seldom of any value. He suggests that the mucous membrane and perichondrium be raised as in doing a septum operation and packed with iodoform gauze between the cartilage and lesion. The incision should be about a quarter inch in front of the lesion and the membrane should be elevated as far behind. In case the lesion has eroded through the membranes the edges of the ulcer are raised in the usual manner and the bare cartilage scraped. The gauze is then put in place and removed after a day or so. It is claimed that the pro-

(8) Jour. Amer. Med. Ass'n., Dec. 2, 1916.

cedure causes a thickening and that hemorrhage will never again occur in that place.

A report of thirty-eight cases is appended.

The After-Treatment in Submucous Resection of the Nasal Septum. With an experience of 129 cases, in the first seventy-five of which Bernay sponges were used as packing, S. M. Key[9] was dissatisfied with the number of complications, such as otitis, sinusitis, hematomata and abscess of the septum, tonsillitis, etc., and so resolved not to pack the nose. He found, in fifty-four cases treated in this manner postoperatively, much satisfaction in that the convalescence was shorter, results better and complications fewer.

The Sinuses.

Conservative Treatment of Diseases of the Nasal Sinuses. According to E. L. Van Sant,[1] the principles governing conservative treatment of sinus disease are: (1) the establishment of drainage and ventilation; (2) evacuation of the pus; (3) removal of the underlying causes.

Drainage may be obstructed by intranasal conditions such as deviated septum, enlarged turbinates, polypi, and turgescence of the nasal mucosa. Naturally, the removal of such obstructions will aid both drainage and ventilation of affected sinuses and often lead to a cure without any direct surgical procedures in the sinuses themselves. For the relief of turgescence the author recommends the insertion of cotton plugs soaked in a glycerine solution of one of the non-irritating silver preparations between the swollen turbinate and outlet of the sinus. They excite a copious mucous discharge from the nose without irritation and greatly reduce the congestion. Hot water applications placed over the face and forehead are also beneficial. At times cold applications do better than hot. The normal outlets of the sinuses may often be opened by the use of a thin stream of heated air injected forcibly across the openings.

Pus may be removed by changing the posture of the

(9) Texas State Jour. Med., May, 1916.
(1) New York Med. Jour., March 24, 1917.

head so as to bring the normal opening of the sinus into the lowest position. The antrum may be washed through the normal ostium or else through a trocar and cannula following which various medicaments may be injected. The use of a suction apparatus is successful in aiding removal of pus.

The general treatment of the patient is important. Plenty of fresh air, attention to the excretory organs, the removal of general dyscrasias all have a tendency to aid the cure of the local condition. Van Sant uses vaccines in selected cases with good results but cautions against their indiscriminate use in all cases.

[A sharp distinction should always be made between the treatment of acute and that of chronic cases. Acute cases rarely require any surgery. Chronic cases rarely require anything more than intranasal surgery.—Ed.]

Extensive Cholesteatoma Following Luc-Caldwell and Killian Operations Simulating Sarcoma. Dabney[2] cites the case of a man of 42 who had nasal obstruction, exophthalmos, deviation of the septum, and polyps in the middle meatus with acute exacerbation. A Luc-Caldwell operation was performed and extensive exenteration of the ethmoid bone done, with subsidence of the symptoms.

The symptoms recurred, however, and five days later a Killian operation was done with excellent cosmetic results. Eleven days later, an abscess developed in the cheek which was evacuated by an incision below and parallel to the lower eyelid. Subsequently there was distention of the cheek, spontaneous hemorrhages, and hardness of the mass which, with the radiographs seemed to point to sarcoma. Two months later, an operation was performed, revealing an immense mass of true cholesteatoma. The odor was overpowering and the bone above, below, and to the sides of the mass was eroded and destroyed, including the floor and inner wall of the orbit, two-thirds of the molar bone and all the outer wall of the antrum. At the time the case was reported the condition of the patient was grave and death was imminent. Syphilis, tuberculosis and malignancy were all excluded.

(2) Trans. Amer. Laryngol. Ass'n., 1916.

Malignant Disease of the Nose or Accessory Sinuses. Two cases with no recurrence in 5½ and 3½ years are reported by St. Clair Thompson.[4] The operation chosen was that devised by Moure in which the field is exposed by means of an incision starting at the inner extremity of the eye, thence downward half-way between the nasal bridge and inner canthus. From this point, one incision is carried outward, curving out to the prominence of the malar bone; the other is carried downward along the nose-cheek junction to the ala. The ala may or may not be included. All structures are stripped free from the bone. A free exposition of the nasal interior is to be had by removing a rather generous portion of the bone in the indicated region.

The results have been uniformly satisfactory and the scar after a few months is so slight as to be nearly negligible.

Thompson now uses a single incision, thereby avoiding the one extending to the malar prominence. This allows a very good exposition of the field of operation. [Moure concurs with him in this.—Ed.]

Cases of Sinus Infections Terminating Fatally. These cases are reported by Knutson.[5]

1. A case of acute pansinusitis with osteomyelitis and acute purulent meningitis: operation; death.

The patient, a man of 38, was entered on January 1: death occurred on May 24. At the beginning, his symptoms pointed to a left-sided pansinusitis with subperiosteal abscess in the frontal region. In spite of energetic radical operative procedures there developed an osteomyelitis of the frontal and parietal regions. A large portion of the frontal and parietal bones was removed but the meningitis developed nevertheless.

2. A case of chronic bilateral ethmoiditis with polypi; chronic nephritis; acute purulent meningitis: death.

The patient, a man of 39, was entered on January 20: death ensued January 31. Both nares were filled with polypi. Antral puncture was negative; transillumination of the frontals was negative; percussion was normal.

Operation on January 21: The right ethmoid cells

(4) Lancet, May 13, 1916.
(5) Otol.-Laryngol., Meddelanden, Stockholm, Vol. 2, No. 3.

were exenterated and the sphenoid opened up: sphenoid negative, pus in posterior ethmoid. That evening the temperature was 38.3 C., pulse 84, headache. Gradually subjective and objective symptoms of meningitis developed. Death on January 31. Autopsy confirmed the diagnosis and showed that the dura nearest the affected bone had not been injured.

3. Case of acute left-sided pansinusitis; cerebral abscess: death.

The patient, a maid of 21, was admitted on June 29: death occurred on June 30. On June 6 she had had an external operation on the left frontal and an exenteration of the left ethmoids. The patient was dismissed on June 15 and treated in the dispensary. In spite of good drainage she complained of severe headache, but disappeared from the clinic for two weeks. On her return she showed evidences of some intracranial complication. While preparing for operation she suddenly died. Autopsy showed an abscess the size of a goose egg in the left frontal lobe that had ruptured into the lateral ventricle.

External Frontal Sinus Operation. J. Beck[6] considers the *x*-ray picture of great value in the diagnosis of pathology in the frontal sinus and recommends better coöperation between the rhinologist and roentgenologist. He distinguishes the following types of frontal sinus changes: (1) Simple congestion or acute inflammation. (2) Simple congestion or acute inflammation plus acute osteitis. (3) Chronic infiltration of the lining membrane with myxomatous degeneration. (4) Same as No. 3, plus superficial osteitis. (5) Same as No. 4, plus necrosis and even sequestration. (6) Hyperplasia of the lining membrane with formation of polypi. No change in the bone except perhaps a rarifying osteitis. (7) Characteristics of tuberculosis, syphilis, malignant disease and foreign bodies in addition to the chronic infiltrative inflammation.

Beck reviews the various types of external operation that have been practiced and then describes his osteoplastic flap operation which he has used with success during the past eight years, recommending it in such

(6) Jour. Amer. Med. Ass'n., Dec. 16, 1916.

cases as have failed to yield to intranasal measures. The steps in the operation are delineated thus:

1. Roentgenogram, postero-anterior, for proper anatomic outlines.
2. Celluloid model made from tracing of frontal sinus from roentgenogram.
3. Incision through skin and subcutaneous tissue along the upper margins of the eyebrows, and these united across the bridge of the nose.
4. Dissection of the skin and subcutaneous flap upward.
5. Celluloid model placed over exposed area.
6. Incision through periosteum along the margin of the celluloid model.
7. Chisel and burr along this lateral periosteal incision from one supra-orbital margin to the other in the interior of the frontal sinus.
8. Gigli saw engaged in the upper edge of this incision and brought down to the level of the supra-orbital margin, thus cutting the septum of the frontal sinus, then saw slightly upward to weaken the pedicle.
9. Turn this osteoperiosteal flap down. Remove the pathologic tissue, but carefully avoid exposure of bone of any great extent.
10. Enlarge outlet of sinus in the nose backward and outward by means of electrically driven burr, carefully avoiding the internal crest by use of Halle protector.
11. Semisolid rubber tube inserted into the outlet, one end coming at or near the nostril, the upper end at the beginning of the outlet. Through this tube a strip of prepared gauze is packed, the upper end loosely filling in the cavity of the sinus.
12. Osteoperiosteal flap brought back into position and the skin and subcutaneous tissue flaps brought down and sutured or closed by use of clips.

If only one side is to be opened the bony flap should follow the model of that side only; however, the skin and subcutaneous flap should be as outlined above.

Beck's statistics show an apparent cure in twenty-seven patients out of a total of thirty-one operated on.

After-treatment consists in removal of the gauze in two days and the tube in five days, with no further

drainage required. After three weeks the sinus may be washed with normal saline or bismuth paste injected.

Oblique Method of Roentgenography of the Ethmoid and Sphenoid Cells. Iglauer[7] finds an objection to the customary postero-anterior projection for pictures of the sphenoid and ethmoid sinuses because these cells lying in a line vertical to the plate overlap each other, thus rendering it difficult to differentiate between the anterior and posterior ethmoids and sphenoid. The lateral projection is also inadequate, he says, because the cells of both sides are superimposed thus making it difficult to say on which side the disease is located. The author, therefore, recommends the oblique method of Rhese, the technique of which is as follows: "The patient lies on the side on the table with the face in contact with the plate. (The position is that of a person sleeping on the side, the arm under his read representing the plate.) The head is in contact with the plate at three points, namely, the malar eminence, the outer edge of the supra-orbital margin and the tip of the nose. The central rays go through the upper edge of the auricle, and are thus directed obliquely through the head, but vertically on the plate." The normal landmarks and findings by this method are described thus. The margin of the orbit appears as a circle. Within the circle is a horizontal line representing the suture between the lamina papyracea and the frontal bone. The superior fissure of the orbit is represented by a line descending vertically in the posterior half of the orbit. Parallel to and a half inch anterior to this line is another vertical line representing the line of junction between anterior sphenoid face and the bony septum. At the junction of the posterior vertical line and the horizontal line there is a small circle representing the optic formen. The sphenoid sinus appears as a rhomboid or oval bounded by the two vertical lines. The ethmoid cells are bounded above by the horizontal line and below by the margin of the orbit, and frontal-ethmoidal cells are seen anteriorly near the floor of the frontal sinus (Plate VII).

Judgment in each individual case will be aided by having pictures taken of both sides.

(7) Jour. Amer. Med. Ass'n., Dec. 23, 1916.

The Surgery of the Ethmoid Labyrinth. The importance of the ethmoid labyrinth is better appreciated, says G. E. Shambaugh,[8] when we realize that it is involved to a greater or less extent in all intranasal inflammatory conditions. One with considerable experience in dealing with the ethmoid surgically knows the unusual anatomic variations which he is liable to encounter and thus approaches each case in a *cautious* manner. Ethmoid operating is not such a simple procedure as one at first might think. The postoperative complications may be dangerous, more so perhaps than any other intranasal procedure. Unfortunately, the *x*-ray does not show the various anatomic variations clearly enough to warn us.

Shambaugh's work is rich in clear and instructive drawings which are here reproduced because one should frequently look at drawings or anatomic specimens to refresh his mental picture (Plates VIII-X).

Two principles should be kept in mind in selecting a method for the ethmoid exenteration: the first is the safety of the patient, the second, simplicity of technique.

Removal of the middle turbinate gives a better exposition of the field and facilitates the healing process. In the ethmoid itself, if one bears in mind that by keeping away from the septal side he is less liable to encounter the cribriform fewer dire results would be had. This is best accomplished by allowing the mesial wall to stand until the exenteration has been accomplished.

Chronic Suppurative Ethmoiditis. The treatment of chronic suppurative ethmoiditis is essentially surgical, says W. S. Tomlin.[9] The condition may be attacked satisfactorily through the nose, in the majority of cases at least. Not enough attention is paid to the contributory factors, *e. g.*, those affecting the distribution of air currents, etc., which interferes with the drainage of the ethmoid. Tomlin says that the septum may be operated on at the same time providing the initial incision is not made on the same side on which the ethmoid is opened. However, he deprecates the use of packing following an ethmoid exenteration. Enough of the middle turbinate

(8) Jour. Amer. Med. Ass'n., Dec. 23, 1916.
(9) Jour. Ind. State Med. Soc., June, 1916.

may be removed to insure a good field. When a complete ethmoidectomy is indicated the Ballenger knife is preferred by Tomlin to the Mosher operation.

Secondary operations should not be considered until after six or eight weeks have elapsed. Much is to be gained by removing all shreds and spicules of bone as the convalescence is shortened appreciably. The use of irrigations does not usually give such satisfactory results as the dry method of postoperative care.

Dr. J. D. Heitger, in discussing the paper, suggests that extranasal attack is indicated whenever the suppurative process has found a way to the outside or when intracranial complication is imminent. This is a good point.

Intranasal Exenteration of the Ethmoid Labyrinth in Pansinusitis. The method H. P. Mosher[1] uses and one very popular among rhinologists is as follows:

The anterior end of the middle turbinate is first removed. The initial plunge of the curette into the ethmoid labyrinth is best made by disregarding the agger nasi cell if it is present and going higher on the superior overhang; *i. e.*, the extreme upper part of the middle turbinate and a little further backward. If the curette does not readily break into the labyrinth, it should be carried a little higher and a little further back. This seems difficult for one not used to the method. When the curette has entered the labyrinth it is turned and swept forward until it strikes the posterior surface of ascending process of the superior maxillary. Then it is turned so that it faces posteriorly, and by backward and downward sweeps the unciform process, the ethmoidal bulla and its cells are opened. Then all fragments of bone and shreds of tissue are removed carefully. One at this point is ready to probe the nasofrontal duct. Some difficulty may be encountered but it usually can be found.

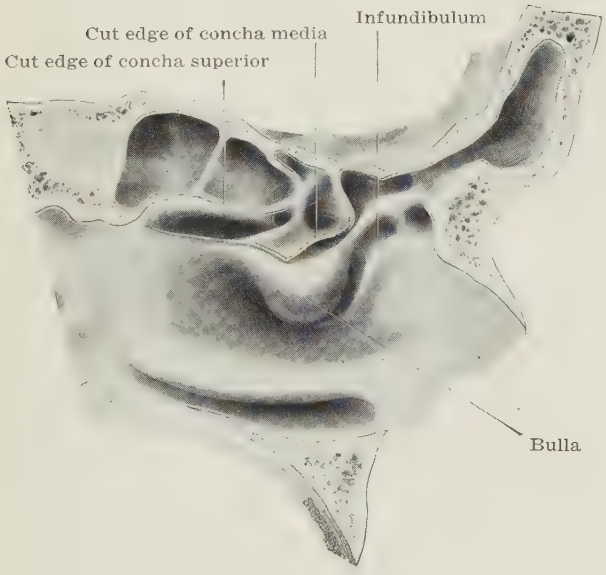
The second part of the operation is carried on *by holding the head so that the cribriform plate is level.* The curette is plunged through the attachment of the middle turbinate and carried backward to the outside of the middle and superior turbinates to the front wall of the

(1) Trans. Amer. Laryngol. Soc., 1916.

PLATE VII.

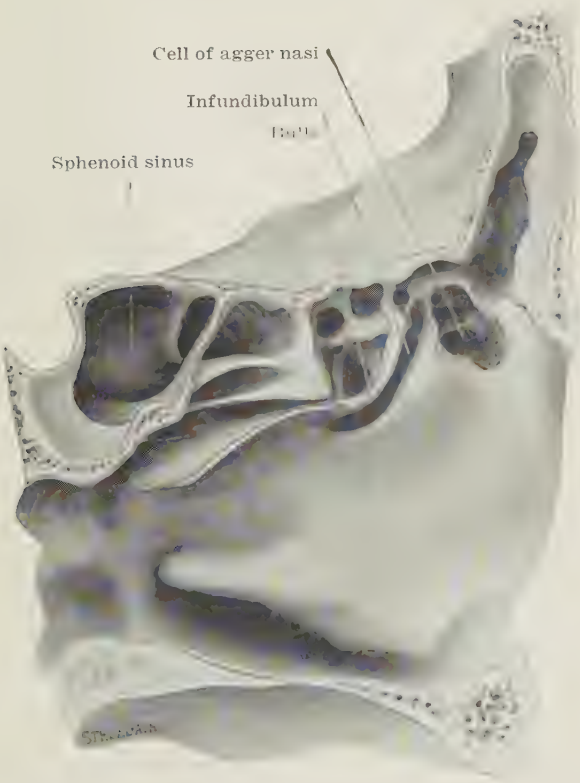
Position of skull, and direction of central rays, marked by arrow: 5, Roentgen-ray plate; 1, roof of frontal sinus; 2, of anterior ethmoids; 3, of posterior ethmoids; 4, of sphenoid. Dotted lines indicate projection onto plate.—Inglauer (see page 294).

PLATE VIII.



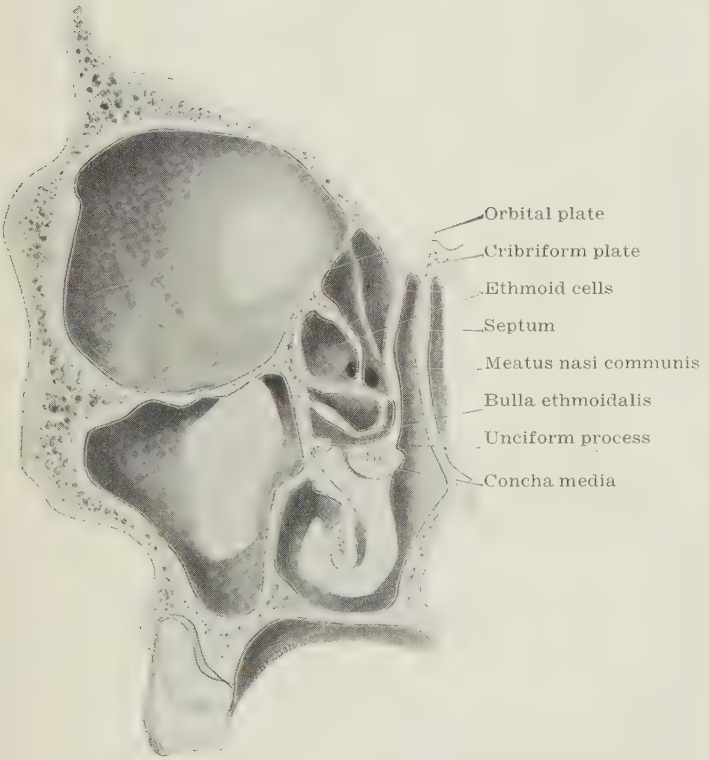
Lateral wall of nose; middle turbinal removed and ethmoid cells opened; bulla ethmoidalis large and dependent.—Shambaugh (see page 295).

PLATE IX.



Lateral wall of nose; ethmoid cells opened. Cell in agger nasi.—Shambaugh (see page 295).

PLATE X.



Frontal section, showing relations of ethmoid labyrinth to surrounding structures.—Shambaugh (see page 295).

sphenoid sinus. This offers firm resistance. The face of the curette is next turned downward and the bowl and shaft forced through the bottom of the ethmoid labyrinth. This loosens the posterior half of the middle turbinate so that it can be removed. The upper third now remains and presents itself as a prominent antero-posterior ridge composed of the middle turbinate in front and behind the superior turbinate. The amount of this ridge left determines the thoroughness of the operation, and facilitates work on the sphenoid.

Packing over night is advisable.

[Such operations should always be done in a hospital. An intranasal pack need not be inserted; should bleeding occur subsequently the interne can introduce the tampon. —Ed.]

Sphenoid Sinus. Skillern[2] reviews the history of sphenoid sinus surgery and discusses the various methods in vogue. He calls attention to the following as being the positive indications for radical opening of the sinus.

Chronic sphenoid sinusitis with typical pain, profuse discharge and occasional symptoms of retention.

When orbital or cerebral complications threaten or have occurred.

When the conservative method has been tried and found ineffective.

Mucocele or pyocele of the sinus of long standing.

The radical procedure will also depend on the accessibility of the sinus being indicated in those cases in which the nasal or free portion which normally represents about two-fifths of the face of the sphenoid, the other three-fifths being behind the ethmoid labyrinth, is narrowed anatomically or through inflammatory swelling.

The various forms of disease requiring treatment are as follows:

1. Acute inflammations: These usually are a part of a general affection of all nasal mucosae and require no treatment *per se*. If it occurs as an exacerbation of a chronic sinusitis we have then to deal with a pyocele which will be considered later.

2. Chronic inflammations: The characteristic symptoms are persistent pharyngitis sicca, postnasal dis-

(2) Jour. Amer. Med. Ass'n., Dec. 23, 1916.

charge, fullness and dryness in the nasopharynx, hawking and rasping in the morning. Rarely is there any frank suppuration. These cases should be treated by conservative methods, merely enlarging the natural opening to permit aëration and drainage.

3. Chronic purulent inflammation: Usually the mucosa is diseased only in areas, there are frequent acute exacerbations with headaches and profuse discharge. During the quiescent stage there is dull headache, postnasal discharge and a tendency to frequent colds. The conservative operation is here also advised, a good-sized opening being made with the Faraci bone-cutting forceps, the middle and superior turbinates being disturbed as little as possible.

4. Chronic purulent inflammation with permanent changes in the mucosa and underlying bone: This type is less frequent than the former, of which it is an advanced stage. It is accompanied by disease of the ethmoids and requires a radical operation.

5. Mucocele: This condition is infrequent and requires a radical operation as the mucosa has been converted into the membrane of the sac. It is therefore necessary to remove a large part of its walls, otherwise the condition will recur. The danger of a mucocele is in its steady growth which causes absorption of underlying bone.

6. Pyocele. Closed empyema: This may result from the drainage passage becoming closed or from a mucocele becoming infected. It requires a prompt radical operation, as there is always the possibility of some grave intracranial complication supervening.

For the primary opening of the sinus there are two methods: one is to attack the sinus through the nasal or free surface and the other is to reach it by opening the ethmoids which lie anterior to the sinus. The latter or indirect method has the advantage that it strikes the thinnest portion of the frontal wall of the sphenoid and permits a larger opening than the other. It is of value where the posterior portion of the septum is deflected to the diseased side. Its disadvantages are that the sphenoid ostium can not be used as a point of orientation and even in skilled hands is not without danger.

The sharp hook originated by Hajek is of great value, being slender and easily introduced even through a narrow olfactory fissure. It is introduced into the ostium and is used to break away the anterior sphenoid wall to make room for the curette. It is also useful where the landmarks are vague on account of blood and diseased tissue, being easily controlled and making it possible also to enter the sphenoid by breaking down the ethmoid cells lying anterior.

The electric burr is dangerous, being difficult to control except in very skilled hands.

The chisel is also unsafe, there being cases reported of accidental entry into the cavernous sinus or injury to the optic nerve. Dehiscence of the bone of the superior and lateral walls of the sphenoid is not infrequent.

Punch forceps which hook into the ostium have been devised by Faraci and Hajek are safe and easily controlled. The evulsor and hand burr are also mentioned and discussed, but have been found unsuited in most cases.

The dangers that may be encountered during the operation are as follows:

Hemorrhage: Usually there is little bleeding. When working on the floor of the sinus one may wound the sphenoidal branch of the nasopalatine artery. When the sinus is opened the cavernous sinus, lying laterally, is to be avoided.

Rhinorrhea cerebrospinalis: The escape of cerebrospinal fluid usually produces no evil effects; the discharge may continue for twenty-four hours.

During irrigation: After the sinus is opened it is unwise to irrigate, as symptoms of cerebral irritation may ensue.

Antiseptics: Strong antiseptics should not be applied after operation, as they cause an increase in the postoperative swelling.

Packing: Tight packs are very injurious, leading to marked cerebral symptoms.

The after-treatment should be simple. The chief objects are to provide drainage and aëration. Postoperative edema of the mucosa usually subsides spontaneously. If after a week or ten days necrotic spots persist they

may be gently curetted. Silver nitrate may be used to keep the opening from granulating too fast. Tampons should not be used except for the control of hemorrhage. Postoperative hemorrhages have occurred as late as the fifteenth day.

DISEASES OF THE THROAT

THE MOUTH.

Mouth Infections.[1] "It is not always essential that visible evidence should be present in the mouth of the focus producing systemic infection, to prove that the portal of entry was in the mouth."

"A portal of entry may be present and not directly demonstrable in any way; for example, when the bacteria enter the blood or lymph stream by way of the tonsils. That a focus does exist in the mouth and that it is directly responsible for the pathologic condition has been repeatedly proved by removing the source of infection or by treatment with a proper autogenous vaccine made from bacteria isolated from the pus at the site of the focus. Such treatment often causes the disappearance of the systemic pathologic condition."

There are many avenues in the mouth; *e. g.*, gums, roots of teeth, etc. Rosenow has shown that many gastric ulcers are associated with tonsillar infection. Stone has shown a very definite relation between enlarged cervical glands and foci of infection in the tonsils, even though the tonsils appear to be negative on examination.

Prevalence of Chronic Mouth Infection and Their Management. The examination and study of the histories of 498 cases of chronic arthritis in the service of Dr. Frank Billings at the Presbyterian, Chicago, is summarized by F. B. Moorehead[2] as follows:

"1. The incidence of chronic mouth lesions in a group of over 700 carefully analyzed cases, showing percent-treatment of root canals are strong predisposing factors of chronic alveolar abscess.

(1) Dept. of Therapeutics, Jour. Amer. Med. Ass'n., Nov. 4, 1916.
(2) Jour. Amer. Med. Ass'n., Sept. 16, 1916. Also Practical Medicine Series, Vol. I, 1917, p. 49.

ages ranging from 69 to 89 per cent. must be looked on as more or less serious evidence.

2. The overwhelming majority of chronic abscesses being associated with previously treated root canals serves to emphasize the importance of root canal technique.

3. Both in diagnosis and in determining the extent of tissue lost, the Roentgen ray is paramount.

4. The involvement of the peridental membrane is the crux in deciding between conservative and radical treatment.

5. Faulty root canal technique, the careless use of arsenic as a devitalizing agent, the irritating drugs in the

6. In carefully selected cases, conservative measures should be employed both in the treatment of chronic abscess and chronic suppurative pericementitis.

7. Where root canals have been disinfected and filled, portions of roots resected, etc., the process of repair should be checked up by roentgenograms made at frequent intervals.

8. Regardless of whatever treatment may be employed, the removal of infection is imperative in all cases, whether the patient at the time may be well or ill.

Where the health, comfort and usefulness of a patient are to be weighed over against a tooth, or even all the teeth, the greater interests of the patient must be preserved."

The Oral Cavity in Relation to Ear, Nose and Throat. Carmody[3] calls attention to the necessity of carefully examining the oral cavity in ear, nose and throat infections because of the close relationship between these structures and the frequency with which the oral cavity acts as the primary focus. The intimate neural connections are illustrated by the familiar toothache or pain in the jaw frequently caused by impacted cerumen in the external auditory canal, the production of cough by pressure on the lower portion of the canal, pain in the ear due to ulcer of the tongue or abscess of the third molar, etc.

Eight cases are cited illustrating these connections: A man aged 27 was completely relieved of severe neu-

(3) Ann. Otol., Rhinol., and Laryngol., March, 1916.

ralgic pains in the ear and side of the head by the extraction of a tightly impacted upper third molar.

A young woman of 22 who had suffered for months with swelling of both sides of the face and severe pains in the ear and mastoid had her wisdom teeth extracted obtaining prompt relief.

A man of 24 having received a blow on the side of the head developed pain and swelling in front of the ear. The ear was found to be normal and a diagnosis of parotitis was made which was later changed to tuberculosis of the parotid.

A woman of 52 had been under treatment for months for alleged cancer of the nose and upper jaw. A sinus was found in the mouth which when probed disclosed a hard substance which upon being examined by the *x*-ray proved to be the crown of a tooth. When it was removed an opening was found leading up to the floor of the nose. The whole condition cleared up

A young woman of 17 complained of swelling on the right side of the face with obstruction of the right nasal passage. The *x*-ray revealed a partially developed molar in the right antrum just above the first and second molars. A diagnosis of dentigerous cyst was made, the sinus opened and a large amount of straw-colored fluid evacuated. The molar was removed and recovery ensued.

A young man of 22 complained of swelling of the neck over the larynx. The swelling extended up to the floor of the mouth. The laryngeal examination was negative, but in the mouth a patulous foramen cecum was found. A probe passed into it continued down the thryro-glossal into an abscess cavity. The swelling promptly subsided and did not recur.

Focal Mouth Infections, Their Systemic Effects, and Treatment. Babcock[4] refers to the work of Rosenow, Moody and others along these lines and to the results of numerous animal experiments which have shown the infective agent in blind alveolar abscesses to be the *Streptococcus viridans*. He emphasizes the possibility of invasion of the heart muscle by this organism in the human as has been definitely proved in animals.

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(4) New York Med. Jour., Dec. 2, 1916.

One case quoted was that of a woman of 52 who had been an invalid for two years because of asthenia and weakness of the heart. There were no murmurs, but the tones were feeble, there was increased dullness to the left; blood-pressure 130, leukocytes 17,000. There was no history of acute infection, but the presence of a loose tooth led to a Roentgen-ray examination disclosing a large alveolar abscess. Several teeth were extracted and an abscess cavity opened which yielded an unusually foul smelling pus that showed *Streptococcus viridans* and an anaërobic fusiform bacillus. Under local treatment and the use of autogenous vaccines the patient made a complete recovery.

Another case of the author's concerned a man of 31 who suffered severe angina pains, particularly when walking, so that a diagnosis of coronary sclerosis was made. There was no history of acute infections and the Wassermann test was negative. There was a moderate dilatation of the heart, no murmurs, tones feeble, and a fall of systolic pressure after hopping. Two suspected teeth were examined disclosing an alveolar abscess; also the *x*-ray showed dilatation of the heart after exercise. The patient was cautioned to rest, the abscess was treated and an autogenous vaccine given. The anginoid pain was proven to have been a myalgia or myositis, the movement of the shoulder and pectoral muscles incident to walking causing aggravation of the pain.

The third case was that of a physician, 52 years of age, who had tonsillitis, acute inflammatory rheumatism and complete freedom from attacks since a tonsillectomy which was performed six years ago. Since then the patient had been suffering a chronic arthritis of the sacro-iliac synchondrosis, necessitating the wearing of a back support. There were two attacks of acute dilatation of the heart. Later there was a moderate myocardial deficiency, some enlargement, asthenia, and stiffness of the limbs. The teeth were examined and found to be in such poor condition that all of the lower teeth except four or five had to be removed. The pus showed *Streptococcus viridans*. Under proper general and local treatment the case made a favorable recovery.

The author further alluded to the relief of spasmodic

asthma in several of his patients following the treatment of alveolar abscesses.

The Ameba in Pyorrhea Alveolaris and Other Mouth Infections. Joseph Mandel[5] says that amebas constitute an important finding in the oral cavity of man and the entameba is not, as postulated by Bass and Johns, the specific cause of pyorrhea alveolaris. While the organism may be found in all cases of pyorrhea, it is also present in many cases of poor oral hygiene, particularly where the teeth are covered with cheesy concretions. In individuals whose oral hygiene is scrupulous the amebas are found in every other case. According to the author the presence of the organism in connection with a general depression of a patient's resistance is usually accompanied by a hyperleukocytosis in the exudate of the gingiva and may be considered as a distinct predisposition to alveolar pyorrhea. If the oral cavity be investigated during the course of infectious diseases, it will be observed that the amebas are absent during the acute stage and generally present in the chronic stage.

By means of good oral hygiene the amebas may be kept out entirely or at least their vitality greatly weakened.

The Relation of Peridental Gingivitis to Vincent's Angina. Taylor[6] and McKinstry say that ulceromembranous lesions of the pharynx and tonsils caused by the spirillum and *Bacillus fusiformis*, called Vincent's angina, may also be found on the mucous membrane of the mouth and gums and have been described as ulceromembranous stomatitis and gingivitis. The authors, however, were particularly concerned with that type due to the same infection which is found only on the gums immediately in contact with the necks of the teeth and which, though similar to pyorrhea, nevertheless differs from the latter in the absence of pus and pus pockets. This type of infection is associated with the typical Vincent's angina of the throat and was found co-existent in all of seventy cases of the latter that were investigated. Conversely, out of 150 cases of fusobacillary

(5) Ann. de l'Inst. Pasteur, Vol. 30, No. 6.
(6) Brit. Med. Jour., Mar. 31, 1917.

gingivitis, the characteristic lesions of Vincent's angina were found in the pharynx or tonsils.

The histories of these cases all show that the gums were infected first, preceding the sore throat by days, weeks and even months. Unless the gums are treated the patient is subject to repeated infections of the throat from this source and the authors, therefore, lay great stress on the examination of the teeth and gums for the Vincent's organisms in all cases in which a throat presents lesions suspected of this trouble.

THE TONGUE.

Parenchymatous Glossitis. This being a rather rare disease, Lubman's[8] case is a welcome addition to the number on record. The affection occurs during the winter months more generally in males than females, and between the ages of 20 and 40. It may be endemic. Prolonged exposure to atmospheric changes may predispose. It may occur reflexly following the application of chromic acid to ear granulations as in a case of R. Lewis or following a submucous resection as in Frank Raynor's case.

Other etiologic factors are jagged edges of broken teeth, wounds from picks, spiculae of bone, pins, and needles; wounds from the teeth during epileptic attacks or other convulsions; corrosives, calculi, stings and bites of venomous insects.

The symptoms appear suddenly and usually unilateral although later they may become bilateral. There is a sensation of heat and swelling in the tongue followed by stiffness and impediment in its movement. There are rigor, fever and pain in the head and neck. In a few hours the tongue becomes so enlarged as almost to fill the entire oral cavity and depress the jaw. The tongue projects beyond the teeth and lips. The soft palate is lifted and the epiglottis depressed thus making respiration laborious. Deglutition and articulation are difficult. The submaxillary and sublingual glands are seldom involved unless the lesion suppurates.

(8) New York Med. Jour., Dec. 9, 1916.

The tongue becomes hard to the touch, saliva dribbles from the mouth, and the expression is anxious. There is marked thirst and the odor from the mouth is offensive. The pulse ranges from 100 to 110, and the temperature about 103 to 104 F. The symptoms reach their height in forty-eight hours and then gradually subside. If the process terminates in suppuration the local symptoms increase in severity until the pus is evacuated.

The pathology consists of a rapid distention of the organ by blood, followed by infiltration of fibrin and serum into the intermuscular connective tissue. It is probably due to the vasodilator influence of the glossopharyngeal and chorda tympani nerves.

The prognosis is not unfavorable, as the mortality of 145 cases collected by Bennet was less than 3 per cent.

The treatment consists of rest in bed, catharsis and leeches to the hyoid bone on both sides; small pieces of ice to allay the thirst and burning; mild mouth wash; cold compresses to the neck; and small doses of morphine.

Radium in Treatment of Lymphangioma of the Tongue. Two very striking results of treatment with radium are recorded by G. B. New.[9] Both occurred in young individuals, one 12 and the other $2^1/_2$ years. Superficial application alone was used.

[In a personal interview with New, who has had considerable experience with tumors in this region, he tells me that in all inoperable tumors, or tumors that can be operated on but with great difficulty, he prefers to use radium and has had much better clinical results as well as less disfiguring of the patient. There are a large number of men who would be glad to use radium, but the price is prohibitive. This is very unfortunate.—Ed.]

THE PHARYNX.

Otogenic Pharyngeal Abscess. In Fulkerson's[10] case, the first symptoms were earache and temporo-occipital headache lasting three days, when there appeared pain and fullness in the throat on the same side, extending up behind the palate. In a short time there was a rush

(9) Journal-Lancet, Dec. 1, 1916.
(10) Jour. Mich. State Med. Soc., June, 1916.

of foul smelling pus into the throat which nearly suffocated the patient, but brought relief from the headache and pain in the ear. The examination showed edema of the tissues in the lateral nasopharyngeal area on the affected side. Although the drum membrane presented no inflammatory appearance the *x*-ray showed necrosis of bone above and behind the antrum and in the mastoid cortex. A Heath operation was performed and disclosed necrosis in the mastoid extending deeply forward, inward, backward and downward. Pneumatic cells were found in the tympano-mastoid and the author believes there is no doubt but that the pus found its way to the lateral pharyngeal wall through the pneumatic cells adjacent to the Eustachian tube.

An abscess of this type may be produced in four different ways which the author groups under two heads, the subpetrous variety and the suboccipital variety, depending on whether the pus descends from the middle or the posterior cranial fossa. Also these two regions, the subpetrous and the suboccipital, are separated anatomically by the rectus capitis lateralis muscle, which stretches like a curtain between the atlas and the occiput extending laterally from the styloid process to the occipital condyle.

The tip of the petrous bone being in close opposition to the pharynx, infection may be readily transmitted from the one to the other, especially in cases in which the cells of the mastoid extend over the labyrinthine capsule to the internal meatus. Or it might originate from cells extending inwardly from the floor of the middle ear between the labyrinthine capsule and the jugular bulb. Cases have been reported, also, where the infection passed from the middle ear to the pharynx by way of the canal for the tensor tympani muscle and by the carotid canal, where it was surrounded by pneumatic cells. Once the pus reaches the under surface of the petrous bone it may present in the pharynx either above the upper border of the superior constrictor within the lateral pharyngeal fascia or it may follow the levator palati muscle and point above the tonsil as in some peritonsillar abscesses.

The suboccipital variety arises from infection by way

of the "sinuso-digastric" cells located on the inner wall of the mastoid cavity midway between the vertical part of the lateral sinus and the posterior wall of the external meatus, the antrum and the mastoid apex. Or an extradural abscess may leave the skull by way of the occipitomastoid suture, the foramen magnum, the anterior condyloid foramen, or the canal for the hypoglossal nerve. These sub-occipital abscesses may localize behind the sternomastoid muscle or gravitate behind the pharynx.

The symptoms usually include a history of middle-ear and mastoid disease. There may be symptoms of labyrinthitis or paralysis of the 3rd, 4th, 5th, 6th, or 7th cranial nerves. There is usually difficulty in swallowing, edema and swelling of the lateral pharyngeal tissues. If the abscess occurs in the pterygoid region there is edema, pain on the same side of the head below the zygoma and pain on closing the jaw. "The combination of discharging ear or tender mastoid bone with pharyngeal abscess with temporal or facial edema, fixation of jaw or cervical cellulitis should lead one to a correct conclusion."

[We have seen an abscess in the peritonsillar region complicate a septic thrombosis in the jugular bulb in chronic otitis media. The same organism was found in both lesions.—Ed.]

Leukemic Changes in the Pharyngeal Mucosa and Waldeyer's Ring. The case reported by Bross[1] was one of leukemia in a girl of 13 who appeared with symptoms of a peritonsillitis, inflammatory swelling above the right tonsil, edema of the uvula and soft palate. On account of the dyspnea and dysphagia an incision was made. There were petechiae on the back, fever, rapid pulse, marked enlargement of the spleen, and hematuria, all of which pointed to the diagnosis of sepsis. Blood cultures, however, proved sterile. Death occurred on the third day. The autopsy showed multiple subcutaneous hemorrhages, hemorrhagic pachymeningitis interna, traces of aortic endocarditis, marked enlargement of the pharyngeal lymphatic ring with gangrenous degeneration, swelling of the lymph nodes and Peyer's patches

(1) Passow's Bull., Vol. 9, Nos. 1 and 2.

in the ilium, leukemic spleen tumor. Bony specimens showed lymphatic leukemia.

Waxy pallor of the patients, dense swelling of the lymph glands, and a tendency to hemorrhages should call attention to the possibility of leukemia. Any operative procedure should be preceded by an examination of the blood.

Silver Nitrate in Treatment of Vincent's Angina. The lesions associated with Vincent's angina, F. Raymond[2] found usually unilateral or at least more pronounced on one side. The gland below the jaw is involved constantly and usually very early. The ulcerative process burrows deeply while the exudate becomes thinner. The ulcerative process may be very destructive and the healing protracted.

In a third of his cases there were lesions of another character, in one a chancre on the tonsil.

[Some authors contend that Vincent's angina or the organisms at least are usually found secondary to a lesion of another nature, notably carcinoma.—Ed.]

In the management of these cases methylene blue, salvarsan and silver nitrate have given the best results.

The lesion is wiped dry and then painted with a 2 per cent. solution of the silver salt applied by means of a soft cotton applicator. This is repeated twice daily for two days, then once daily till the fifth day. Healing is usually quite pronounced by this time.

Common Causes of Cancer of the Throat: Treatment by Diathermia. Stuart-Low[3] cites three cases of cancer of the palate in which there were the following combination of contributing factors: Syphilis was present in every case; sepsis of the mouth in an aggravated form with an acid saliva; dental deficiency leading to the food being improperly masticated; a habit of taking very hot food, thus irritating the throat.

The treatment in these cases was a preliminary tracheotomy followed by excision of the cancerous masses, after which the diathermia puncture of malignant glands was then employed. The latter is practiced thus: The hard mass of glands having been exposed by freely re-

(2) Prog. méd., Vol. 32, No. 5.
(3) Proc. Roy. Soc. Med., January, 1917.

flecting the soft structures, the diathermia point is pressed into the glands repeatedly at various points and the skin replaced and stitched up. Healing by first intention invariably results.

Diathermia relieves the pain in the throat and in the neck and head. It may be used in the throat following excision of the principal mass by repeated applications at intervals of a few days to the sloughing base.

ADENOIDS AND TONSILS.

The Removal of Adenoid Growths. It can not be understood by J. L. Aymard[3] how anyone can rely upon a digital examination for an accurate diagnosis of the extent of adenoid growth. He uses direct examination with mirror after retracting the soft palate. He contends that curettes do not properly cut out the adenoid mass, as it is too difficult to engage the mass. Aymard uses a curved scissors to better advantage, he thinks. It is his custom to excise the adenoid first and then do the tonsil operation under light anesthesia. The patients breathe better.

[The diagnosis can be made, as a rule, more readily by direct inspection through the nose.—Ed.]

Removal of Tonsils and Adenoids in Diphtheria Carriers. A series of six carrier cases from the Durand Hospital is reported by S. A. Friedberg,[4] in which negative cultures from the throat were obtained soon after recovery from operation. Kaolin and other topical applications had been used but without avail. The convalescence did not differ from the ordinary case. The Shick test was negative in all previous to operation.

From an economic standpoint it is a very important subject. Friedberg thinks it advisable to wait for from two to three weeks following the clinical recovery before the adenoid and tonsils operation is performed.

[This is an important question and should be kept in mind in any case of diphtheria.—Ed.]

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(3) Lancet, June 24, 1916.
(4) Jour. Amer. Med. Ass'n., March 11, 1916.

Faucial Tonsils in Singers. A careful canvass was made by Voorhees[5] among 500 laryngologists and 500 singing teachers for statistics and opinions as to the value of tonsillectomy in singers and the results in such cases. Based upon the replies received and his own experience the author arrives at the following conclusions:

"An analysis of 5,000 tonsil operations in singers shows that in the hands of skilled operators there need be no special fear of bad results.

"It is the consensus that bad results are most often due to cicatricial contractions occurring from careless dissection or from neglected after-treatment.

"Pain in the tonsillar region, neck, and larynx, is probably due to section of some of the larger branches of the glossopharyngeal nerve (Justus Matthews).

"Loss of singing voice after tonsillectomy might be due to a nerve lesion, but is probably due to adhesions and cicatricial formations in the fauces.

"Loss of singing voice occurs very rarely after tonsillectomy. Impaired voice is possible, but most cases show an increased range of from half to a full tone.

"The singer's problem is a very special one, and no laryngologist should undertake to operate on these patients unless he has some knowledge of the art of singing.

"At operation the greatest care and skill must be exercised in securing a clean, free dissection. Injury to the tissues surrounding the tonsil may prove disastrous.

"Postoperative care is of special importance. The patient should be seen daily until full healing occurs."

[The point that the throat surgeon should be a musician is a new one and is not well taken. No postoperative care will prevent contraction developing.—Ed.]

The Tonsil. A Medicolegal Aspect. Whalen[6] calls attention to the injustice of criticising former operators in cases in which a child shows a recurrence of tonsils and adenoids after removal. Various eminent laryngologists and pediatricians have testified to the positive reproduction of these organs after a complete removal in early life. It has been shown that no matter how

(5) New York Med. Jour., Dec. 16, 1916.
(6) Ill. Med. Jour., September, 1916.

skillful the surgeon may be it is impossible to remove every particle of lymphoid tissue in the pharynx and fauces. A minute particle remaining is capable under certain circumstances of growth and development even to attaining the size of the original mass. This possibility must be ever borne in mind not only when tempted to criticize another man's work but also when discussing the after-effects with the parents of the child prior to the operation.

The age limit of such recurrences is not definitely established, but the predilection has been most frequently noted in early childhood.

Chronic Infection of the Tonsils; its Relation to Systemic Disease. W. R. Dillingham[7] in treating the various systemic affections which have as an etiologic or causal factor a focus in septic tonsils, mentions gastric fever in children.

He says: "It occurs so frequently that one may believe that the pathologic condition is common to both—or that these conditions are inter-related."

The interesting feature of the syndrome is the occurrence of a deranged stomach, with fever, acetone odor of breath, flatulence, colic, together with a low grade tonsillitis involving the lacunae. The temperature may be high, *e. g.*, 103-104 F. The patient usually does not complain of sore throat. Too much importance can not be placed on examination of the throat in children.

[Recurring attacks of fever in a child are most frequently caused by tonsil infection. Very often the most conspicuous symptom is gastric or intestinal disturbance. —Ed.]

The Tonsil a Factor in Bad Breath. Even the small caseous plugs, which appear innocent enough, may be the cause of bad odor to the breath, says W. R. Thompson.[8] Frequently the odor complained of will be identified by the patient from material obtained with cotton applicator in the crypts.

Connellan-King Diplococcus Infection of the Tonsil. In a series of about 100 cases of arthritis at the Hospital for the Ruptured and Crippled in New York, J. J.

(7) Jour. Kans. Med. Soc., February, 1916.
(8) Southern Med. Jour., June, 1916.

King's[9] observation led him to conclude that every case of septic arthritis is caused by a focus of infection somewhere in the body. It may be found in the tonsils, ears, accessory sinuses, gastro-intestinal tract, genito-urinary tract and in and around the teeth. The focus most frequently encountered is that of the tonsil and mouth. A very simple tonsillitis may be followed by severe complications. The infection may become latent. When the focus is an infected tonsil, autogenous vaccines should be made and be administered until all infection is cleared up and then the tonsils removed by enucleation. In the Connellan-King diplococcus infection the blood changes seem to be a simple anemia with a slight eosinophilia in a few cases. The author has found vaccine treatment quite satisfactory in a high percentage of the cases treated.

Case of Tonsillitis with Hemorrhagic Adenitis. This case is reported by C. F. Strange.[1] The patient, aged 22, suddenly became ill with acute tonsillitis. Two days later a large swelling on the right side of the neck had appeared and the patient was extremely ill. This swelling was very painful. The following day, under ether, the patient was operated on and the mass was found to be a gland with no signs of suppuration. Countless small hemorrhages had taken place within the gland substance. The gland was left alone, and a plain gauze dressing used. The following day the patient had markedly improved and remained so. Healing took place promptly and without incident.

Tonsillectomy in Acute Tonsillitis. T. L. Higginbotham[2] advocates a really radical change in the attitude of most throat surgeons, in that he has operated on tonsils in the stage of acute tonsillitis with good results. He compares the expediency of the procedure with acute appendicitis. In his experience no untoward results have occurred, and he has had 500 cases. None of the complications which usually follow tonsillitis has occurred.

[We see no good reason for removing tonsils during

(9) New York Med. Jour., July 15, 1916.
(1) Lancet, Oct. 14, 1916.
(2) Jour. Kans. Med. Soc., February, 1916.

an acute inflammation; we do see several good reasons for not adopting this procedure.—Ed.]

The Tonsilloscope and the Exploration of the Interior of the Tonsils in Situ. The tonsilloscope, says

Fig. 55. Shows the external tonsilloscope and the manner of examining tonsil tissues with it.

T. R. French,[3] is an instrument devised for the examination of the tonsil *in situ*. The instrumentarium consists of a tonsil mirrorscope, or a lens tube speculum, and a slender lamp, which can be placed behind, below or

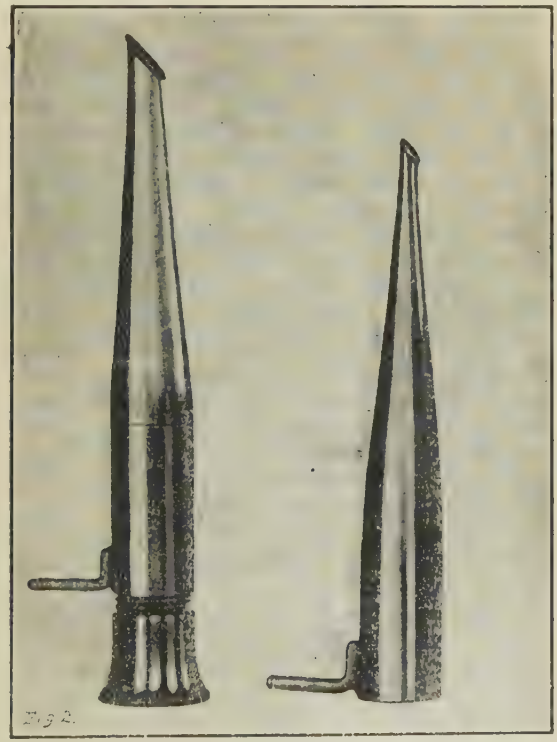


Fig. 56. Tonsil microscopes with large and small apertures.

above the tonsil and buried so that its light is not directly exposed to the eye. The mirrorscope comes in two sizes, the larger intended for examination of the free surface and the capsule; the smaller for the capsule only.

By this method of transillumination, the tonsils light up in much the same manner as does a stained glass window, brilliantly transilluminated from the opposite

(3) New York Med. Jour., May, 1916.

side. The mirrorscope is then used and many conditions within the tonsil can in this way be seen directly. Experience is necessary for interpretation, however. The healthy tonsil is quite translucent, the diseased is less

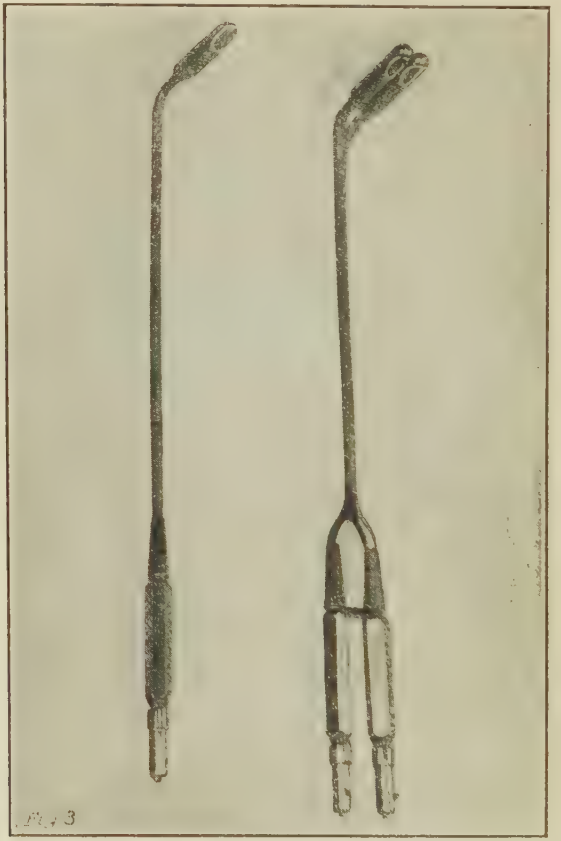


Fig. 57. Single and double tonsil lamps.

translucent depending upon the extent of the pathologic processes.

The following classification of the conditions found in the tonsil are presented by French:

Fig. 58. Illustrates the manner of using the tonsil microscope, while an assistant holds the lamp in position behind the tonsil. When transillumination alone is practiced, the examiner manipulates the lamp as well as the tongue depressor.

Class 1. The Tonsil in Health:

The color is said to be a warm amber. Small arteries are seen coursing the surface and to some extent within the stroma, while occasionally small round spots are encountered.

Class 2. Functional Stimulation or Mild Disease—the Doubtful Class:

Here there is a departure from the normal indicated by a pink-amber coloration involving all the tonsil, or by hyperemic blushes covering small areas.

Class 3. Superficial Abscesses:

Dark or black discs appear just under or near the epithelium.

Class 4. Apparently Active or Large Foci of Detritus and Pus Occupying Restricted Areas:

A more or less sharply defined hyperemic area is characteristic of this class.

Class 5. Considerable General Disease:

Here there is uniformly light hyperemia, indicating numerous collections of detritus, not usually pus.

Class 6. Extensive General Disease:

Here the color is deeply shaded, always corresponding to that of the anterior pillar.

French has arrived at the following conclusions as a result of studying 666 tonsils in and from 333 operative cases in children and the study of the tonsils *in situ* in a large number of youths and adults.

1. All enlarged tonsils in subjects above 8 years are diseased.

2. Enlarged tonsils in subjects below 8 years may or may not be diseased, and whether they are or are not can be determined by the tonsilloscope.

3. The tonsils in subjects above the age of childhood are often, and without much doubt, oftener than we now know, the seats of foci capable, under certain conditions, of producing local and systemic infections.

4. In many subjects with tonsils in Classes 2, 3 and 5 it has been proven that they are the source of systemic infection and total enucleation holds out the only hope of complete and permanent relief.

5. Tonsils which are the seat of extreme disease and

which are, therefore, seen to be excessively hyperemic, bleed freely when cut into.

6. The inner wall of a peritonsillar abscess can be located and mapped out with ease.

Anesthesia for Enucleation of the Tonsils. As senior anesthetist to St. George's Hospital, J. Bloomfield[4] can speak authoritatively. He believes that gas-oxygen can not be used satisfactorily in an enucleation operation unless performed with the guillotine, and then no attention can be paid to bleeding. Ethyl chloride can be used in children. Ether or chloroform or a mixture of the two is the most satisfactory. Deep narcosis is dangerous unless the blood is cared for by constant sponging. A preliminary dose of atropine is a great help in that it controls the secretions admirably. Ether causes congestion whereas chloroform does not and with the combination there should be no congestion and there should be sufficient time for even a deliberate operator.

It is better to rely upon position for safety from inhalation of blood than upon the presence of a coughing reflex.

"Sitting, or lying with the head on one side or with the head straight, are usually satisfactory in the case of operators accustomed to the respective positions, but the anesthetist has certainly to vary his practice to suit the circumstances and to keep a keen eye upon the exact extent of the narcosis maintained."

[These conclusions are largely in opposition to ours, which may be stated briefly as follows: Gas is not suitable. Ethyl chloride should not be used, it is too dangerous. Chloroform should not be used for the same reason. Ether should be used and always in the retching position, with the head on one side.—Ed.]

Infiltration Anesthesia for Tonsillectomy Together with the Employment of Normal Saline Solution. Good results have been obtained by M. S. Ersner[5] and his co-workers by swabbing the pillars with 10 per cent. cocaine and then infiltrating both pillars, upper and lower pole, with normal salt solution. There is less danger of toxic symptoms than with injection of cocaine,

(4) Lancet, April 8, 1916.
(5) New York Med. Jour., Jan. 6, 1917.

less danger of postoperative sloughing as with novocaine, which can not be sufficiently sterilized, and which must be used in large amounts. The same is true regarding the sloughing with quinine and urea hydrochloride.

[We have had no trouble from sloughing after the use of novocaine.—Ed.]

The Method of Tonsillectomy by Means of the Alveolar Eminence of the Mandible and a Guillotine. The guillotine method of tonsillectomy, says G. Sluder,[6] "offers the advantages of (1) speed, (2) minor (or any) anesthetic (nitrous oxide), (3) better cosmetic results as a rule, (4) small bleeding and (5) performance by sense of touch independent of sight."

In order to utilize the eminence to most advantage the long axis of the ring must be parallel to the long axis of the eminence which necessitates the shaft of the guillotine, taking as its final direction 45 degrees downward from the line of the alveolus regardless of what may be its outward and backward direction. This can not be too strongly emphasized, as Sluder believes it the cause of failures in the majority of cases.

Sluder does not believe the various modifications of the original instrument have gained anything. The essential thing is a thin strong ring with not too dull a blade.

[There is no method 100 per cent. perfect as yet, as there is no method or surgeon in any surgical procedure 100 per cent. perfect. Let men do their work in the way they were trained or in the manner they do best. Simplification in one's technique and instrumentarium seems to me the goal to be aimed at.—Ed.]

Technique of Tonsillectomy. J. Matthews[7] tabulates the indications for operation and the symptomatic results in 1,000 consecutive tonsillectomies at the Mayo Clinic. Local conditions were entirely satisfactory in 88 per cent. of the cases; slight local symptoms persisted in 8 per cent. and no change was reported in 3 per cent.

In sixty cases of cervical adenitis removal of the tonsils was followed by improvement or cure in 82 per cent.; 18 per cent. showed no improvement. Of 300 patients

(6) Jour. Amer. Med. Ass'n., Dec. 30, 1916.
(7) Journal-Lancet, March 15, 1917.

with rheumatoid affections 75 per cent. obtained relief or a cure. Many of these patients, however, received other treatment aside from the tonsillectomy. Asthma in childhood was relieved in four out of seven cases, chronic cough in twelve out of sixteen cases and croup in three out of five. Three of four patients with chorea recovered within a year. Of nine epileptics, one had remained well for one year, four were much better as to frequency or severity of attacks, and four were no better.

Gastric troubles such as cyclic vomiting of children and other functional disturbances were greatly influenced by the tonsillectomy, twenty-nine out of thirty-three being cured.

There was no severe primary hemorrhage in the series. Some degree of bleeding within the first twenty-four hours was noted in 30.6 per cent. of the cases, less than half of which required any medical attention. In the latter cases the fossa was emptied of blood and a hemostat placed on the bleeding vessel. Late secondary hemorrhage occurred in thirty-four cases; four on the second day, two the third day, three the fourth day, six the fifth day, eight the sixth day, and ten after the sixth day or not stated. Most of these were trivial. Three required the attention of the physician and occurred in cases of hyperthyroidism.

The voice was improved in 219 cases, fifteen mentioning particularly the improvement in the singing voice. Forty-six cases reported the voice as worse after the operation. Many of the latter had been suffering from chronic pharyngitis and laryngitis. The author believes that the operation can do no harm to the voice unless there has been accidental injury to the muscles of the palate and pillars or to some of the branches of the glossopharyngeal nerve which are sometimes in contact with the capsule.

Suction Appliance for Maintaining a Dry Field in Tonsillectomies Under General Anesthesia. The appliance described by S. Israel[8] consists of a metal tube branched in the form of a Y, curved on its long axis to conform to the shape of the dorsum of the nose. To the ends of the metal branches are attached rubber tubes

(8) Laryngoscope, February, 1917.

size No. 19 Fr. about 5 inches in length and perforated with numerous small holes near the distal end. These rubber tubes are inserted along the floor of the nose and project into the pharynx to about one-half inch below and to either side of the uvula. To the stem or single barrel of the metal tube is attached any form of suction apparatus by which, then, the liquid contents in the throat are aspirated while the operation is going on.

[The danger from inhaling blood is greater than some operators have believed. This risk can be avoided by placing the patient on the side; during the operation, the operator sits on a low stool and is slightly below the head of the patient.—Ed.]

Dangers and Complications of Tonsillectomy. Decrying the trend toward indiscriminate tonsillectomy as a panacea for all ills, Moore[9] cites a case in which the operation was done for the relief of polyneuritis with the result that the neuritis spread to all parts of the body, incapacitating the man for many months. There had been no history of previous attacks of tonsillitis within thirty years and examination of the extirpated tonsils revealed no infective areas or foci.

In this case the author believes the widepread polyneuritic phenomenon following the operation to have been due to shock alone, or shock increasing the susceptibility of nerve tissue to an already existing toxin in the blood or some reaction in metabolism, or a bacterial toxin elaborated in the throat perhaps from the sloughing postoperative areas, but certainly not from a tonsil free of infective foci.

From an exhaustive review of the literature, Moore is deeply impressed with the necessity of considering tonsillectomy as a major operation. Among the serious complications that have been recorded as following this operation he details these:

1. Hemorrhage: A large number of fatal hemorrhages are cited and a still greater number of alarming hemorrhages that gave rise to a great deal of trouble and anxiety are referred to.

2. Nervous and Muscular Diseases: An infinite variety of neurologic sequelae are detailed; among them

(9) Med. Record, Dec. 2, 1916.

amyotrophic lateral sclerosis, hemiplegia, hysterical strangulation, spasmodic laryngitis, hysterical mutism, prolonged glottic spasm with cyanosis necessitating tracheotomy, torticollis, chorea, facial paralysis, paralysis of the soft palate, and various postoperative psychic phenomena.

3. Sepsis: Koplik divides these cases into three classes: first, a form running a fever for several weeks without endocarditis or other lesions; second, pyrexia combined with endocarditis, usually fatal; third, sepsis of a hemolytic type with ecchymoses, hemorrhages, and bronchopneumonia. Numerous cases of sepsis are on record with such manifestations as sinus thrombosis, permanent torticollis, gangrene, cellulitis, facial paralysis, edema of the glottis, and retropharyngeal abscess.

4. Among the miscellaneous complications recorded are diphtheria, bronchiectasis, pulmonary embolism, hyperpyrexia, emphysema, pneumonia and pleurisy, rheumatism, status lymphaticus, appendicitis, etc.

5. Local sequelae, which in most cases can be traced to inexpert surgery, comprise adhesion of the pillars causing impairment of the voice, difficulty in swallowing, closure of the Eustachian tube, removal of the uvula, infection in the ears, and cervical adenitis.

The indications for tonsillectomy as recommended by Still and endorsed by the author are as follows:

Recurrent earache with slight impairment of hearing.

General ill health, especially in children, when the tonsils and adenoids are enlarged.

Recurrent attacks of tonsillitis.

Asthma and laryngitis stridulosa only when there are other reasons for removing the tonsils and adenoids.

Deformity of the chest resulting from throat obstruction.

Rheumatic affections. (This has not been definitely established.)

established.) [This appears to us to be the one systemic infection most clearly traceable to tonsil infection in the majority of cases.—Ed.]

Cervical adenitis in a child of tuberculous antecedents.

Certain cases of epilepsy.

"The mere presence of hypertrophied tonsils and adenoids is not sufficient ground for operative interference."

In conclusion, Moore lays down a number of dicta among which the following are of special interest:

1. Tonsillectomies being major operations should be done in hospitals, and the operator should be a specialist experienced in this work. The patient should remain in the hospital three days.

2. Patients and parents should be informed of the possible dangers and complications.

3. Pathologic examination of the extirpated tonsils should always be made.

4. In deciding upon the relationship between the tonsil and the constitutional affections there should be coöperation between the laryngologist and the internist.

5. Taking the coagulation time is a valuable preoperative precaution.

6. Do not operate in the presence of fever, as the patient may be in the incubation stage of measles, scarlet fever, or diphtheria.

7. Do not operate in the presence of any acute condition elsewhere in the body.

8. If avoidable never operate in the winter months. Bronchitis is more apt to follow such a procedure.

9. The snare or dissection method is preferable to any guillotine method.

10. Tincture of iodine applied to the tonsillar fossae after operation, throat gargles, and compound tincture of benzoin when used in the postoperative period are useful applications.

Study of Five Hundred Tonsil Enucleations with Beck-Pierce Tonsillectome. In this series of cases reported by H. Dupuy,[1] the Beck method was used; furthermore, the cases were consecutive and not selected.

In discussing the technique, the author says that when it was possible to "Sluderize" the tonsil, *i. e.*, push the tonsil through the loop of the instrument, "enucleation was well nigh certain" in 85 per cent. of the cases. Individual cases require slight adaptations; *e. g.*, in low hanging tonsils the lower pole may be carried through the loop with forceps first, etc.

(1) Southern Med. Jour., May, 1916.

Hemorrhage was notably less than with other methods, especially if a minute or more time was used in severing the tonsils. Occasionally there was rather brisk bleeding. Dupuy believes the bleeding is less because there was less trauma.

The postoperative reaction was notably less than in any dissection method which he has used. In some cases one tonsil was dissected and the other enucleated and the reaction was much less in the enucleated fossa.

The majority of the patients in this series were under 10 years of age, and Dupuy acknowledges that this may be a factor in the favorable results. Only six adults were operated on. The greater number of failures occurred in patients over 10 years old; this is explained "by the preponderance of submerged—flattened—tonsils with inflammatory adhesions, the low hanging tonsils projecting below the level of the tongue which are usually present after the first decade."

These types offered mechanical difficulties which were overcome with an extended experience.

The very small tonsil offered difficulties until the smaller ring for the instrument was made. He emphasizes the fact that success or failure may depend upon selection of the proper sized ring.

The anatomic results were satisfactory indeed, in that there were fewer local deformities. As the technique improved the results showed less and less tendency to any deformities.

In concluding, the author says, among other things, that the method recommends itself, particularly in young children, before the tonsil has developed pathologic adhesions.

After-Results of Tonsillectomy—A Study of Five Hundred and Seventy-one Cases. The statistics as shown in J. C. Simpson's[2] conclusions are of interest because, although nothing new is added, they show that all results are not entirely satisfactory.

Conclusions: Of 320 sufferers from sore throat, 205, or 64.06 per cent., were relieved.

Of 571 examined, 255, or 44.75 per cent., still had tonsillar tissue present.

(2) Jour. Amer. Med. Ass'n., April 1, 1916.

Of 195 mouth breathers, 114, or 58.46 per cent., were relieved.

Of 571 questioned, 400, or 70.05 per cent., felt their health to have been improved.

Of 48 who had diseases of the ear or impairment of hearing, 37, or 77.08 per cent., were finally relieved.

Of 45 studied 25, or 55.5 per cent. gave an increase in scholarship of 4.45 per cent., while 20, or 44.5 per cent., gave an average decrease of 6.09 per cent.

Of 46 subject to enuresis, 25, or 54.35 per cent., ceased to offend.

Of 33 tested the voices of 32 were improved.

One-third of the patients in a scarlet-fever outbreak, and one-fourth in a diphtheria series had been operated on before the attack. One boy already operated on became a diphtheria carrier.

Secondary Tonsillar Hemorrhage. Impressed with the importance and seriousness of secondary tonsillar, by which is meant, bleeding after from *three* to *fourteen* days, H. B. Decherd[3] sent out a serial letter to fifty men well known in the specialty. Replies were received from forty-two.

Some of the men had never had a secondary hemorrhage in their practice, others confused secondary and primary hemorrhage.

Various causes were given such as "associated with hyperthyroidism": "separation of slough following snare operation"; "movements of pharynx opening veins"; "slough including a vessel," etc. No one seemed to think that any definite reason could be given.

The author, from his own experience, thinks that with the use of the cold wire snare the crushing of the deep tissues surrounding the tonsil may be a factor from the secondary slough more so than with cutting instruments. He further believes it essential that the fossae be cleansed daily until all slough has disappeared.

Nothing new is suggested in the treatment of the condition.

[The abstractor has had two such cases within the last year occurring in adult brother and sister. The brother had had repeated attacks of sore throat with

(3) Southern Med. Jour., June, 1916.

rheumatism and endocarditis. Three weeks following such an attack the tonsils were enucleated with considerable primary bleeding controlled with hemostats. Five days later, the patient awoke with a rather severe hemorrhage. A definite bleeding "spurter" could be seen, and after application of a hemostat no further bleeding occurred. His coagulation time was ten minutes. The sister, with history of repeated attacks of tonsillitis and who had large soft septic tonsils had no primary bleeding to mention, but bled five days later. Clamping the bleeding point controlled the hemorrhage. —Ed.]

Lung Abscess Following Tonsillectomy. This is a discussion by C. G. Coakley[4] of Dr. Manges' paper which was abstracted in Vol. III, this series, 1916; page 332. Coakley is of the opinion that the causal factor is the aspiration of infected material.

Abscess of the Lung Following Operation on the Tonsils and Upper Air Tract. Three cases occurring in his practice are reported by C. W. Richardson.[5] The recovery was slow in each case. Coughing, rise of temperature and sputum should be suspicious signs.

Richardson does not believe that aspiration of blood is the causal factor but that it is more likely metastatic.

[Such possibilities must impress us with the fact that tonsillectomy must not be considered without consequence. It is a hospital operation and requires observation.—Ed.]

A Case of Hemiplegia Occurring Immediately After Tonsillectomy Under Ether. An unusual complication following a Sluder operation is reported by W. A. Scruton.[6] He was helping an assistant operate and the time was longer than usual. The morning of the next day it was noticed that the child could not move the left side of her body. There was a slight rise of temperature. Improvement began in 72 hours but was not complete in six months.

It is suggested that an embolus was the causal factor.

(4) Laryngoscope, July, 1916.
(5) Ibid, idem.
(6) Laryngoscope, February, 1917.

ENDOSCOPY OF THE BRONCHI AND ESOPHAGUS.

Bronchoscopy.[7] In a symposium on this subject Chevalier Jackson considers the mechanical problems, particularly in relation to the extraction of foreign bodies. He points out that the removal of a foreign body from the bronchial or esophageal passage should not be undertaken hastily, but should be preceeded by a careful study of history, symptoms, and Roentgen pictures. After the instrument has been introduced and the foreign body is visible it should be studied as to the relationship between its form, position and surrounding structures so that the simplest mechanical means for its removal may be worked out. Jackson's series of 550 cases showed a mortality of but 1.3 per cent. The majority of these patients were in poor condition when first brought in. In 543 cases the foreign body was successfully removed.

The author recommends the use of small tubes because of the wider range of mobility they permit within the bronchi. Also the to-and-fro movement of the foreign body during respiration, having a range of from 1 to 3 cm. may be made use of to assist the extraction.

In regard to anesthetics, Jackson prefers to use no anesthesia at all in children under 10 years of age. Above this age, he employs local anesthesia, but in no case does he resort to a general anesthetic. The methods of dealing with the various kinds of foreign bodies are then given in detail.

Discussing the possibilities and limitations of nonsurgical bronchoscopic treatment, Ridpath mentions among other things, the usefulness of this instrument in diagnosing such conditions as tumors or growths outside the trachea or bronchi, calcareous deposits on the tracheal rings, false membrane of diphtheritic or other origin, papilloma or other growths causing cough, dyspnea and reflex spasms, ulcerations, strictures, etc.

Tracheitis occurring in either of two forms yields nicely to local endoscopic treatment. In the first type there is an inflammation of the mucosa which is cov-

(7) Jour. Amer. Med. Ass'n., Jan. 27, 1917.

ered with stringy mucous occurring throughout the entire lumen or in isolated patches. In the second type there is a dry condition with crusty scales of a dark or greenish color. For the first condition the author recommends glycerite of tannin applied on tampons daily over the entire inflamed mucosa. For the dry condition he uses silver nitrate after first removing the crusts, or a 10 per cent. alcoholic solution of iodine. For the dry reddened membrane he employs also the ultraviolet ray applied by means of a vacuum through the bronchoscopic tube, giving not more than a one-sixteenth inch spark.

Many cases of asthma have been relieved by bronchoscopic treatment. It is not only possible to locate various local exciting causes of these spasms, but also to apply local measures to reduce the irritability of the membrane. Where the trachea is dry and inflamed, he first sprays in a solution of epinephrine in normal salt (1:5,000 or 1:10,000) to relieve the congestion and follows it with local applications of compound tincture of benzoin with boroglyceride or a 1 per cent. mixture of icthyol in liquid petrolatum.

If there are profuse secretions these must first be removed by vacuum and ulcers treated with silver nitrate or glycerite of tannin.

All treatments may be given twice weekly.

Papillomata of the larynx, which in children often disappear spontaneously, may be treated by fulguration, radium, Roentgen radiotherapy, or medicinal agents. Among the latter are mentioned alcohol (starting with a 50 per cent. solution), salicylic acid in alcohol, and fresh pineapple juice.

The bronchoscope has been a valuable aid in the early diagnosis of tuberculosis as well as in the treatment of laryngeal tuberculous lesions. St. Clair Thompson and Bruhl report an arrest of the local process in 55 and 58 per cent. of the lesions treated. Ridpath prefers the suspension laryngoscopy for such treatments as both hands are free to work. These local lesions are treated by the cautery, curette, or caustic, only a small portion being treated at each sitting in order to avoid the danger of edema.

Among the limitations of bronchoscopy are the cases in which valvular heart lesions with failure of compensation bar the use of this instrument.

In old cases of asthma with emphysema and constant cough with the formation of quantities of mucous the patients do not stand the passage of the tube and besides are very susceptible to the use of cocaine. Aneurism, arteriosclerosis, large goiter, a short thick neck, arthritis in the cervical vertebrae all preclude the use of the bronchoscope.

Speaking of the method of suspension laryngoscopy, Lynch states that there is still room for improvement of the apparatus. Nevertheless, so far as he has gone, he finds this method of great advantage because the operator has both hands free to work with and because it is possible to view the larynx from every angle and to expose even the under surface of the vocal cords. However it is not for use in cases in which simpler means will accomplish the desired results.

Foreign Bodies in the Air and Food Passages. E. Schittler[8] reviews the history of bronchoscopy and esophagoscopy from its earliest beginnings and compares the results of former days with recent statistics. For instance, the literature shows records during the years 1884 to 1894 of 103 esophagoscopies for the removal of foreign bodies with a mortality of 17 per cent. Contrasted to this are the records of Guisez with 930 cases, Gottstein with over 1,100, and Jackson with 206, showing combined a mortality of from 2 to 3 per cent. Even more marked is the difference in the bronchoscopy mortality—300 cases of the removal of foreign bodies during the years 1884 to 1894 gave a mortality of 21 per cent. for the larynx, 15 per cent. for the trachea, and 31 per cent. for the bronchi. A recent series of Jackson's comprising 182 cases gave a mortality of only 1.7 per cent. Kahler of Freiberg reports 291 bronchoscopies for removal of foreign bodies with a mortality of 4.5 per cent. (The latest series of Jackson's cited elsewhere in this book[9] shows a mortality of 1.3 per cent. in 550 cases.)

The author gives a brief account of thirty-four cases

(8) Cor.-Bl. f. schweiz. Aerzte, Feb. 17, 1917.
(9) This volume, page 328.

treated in his clinic during the years 1907-1916, which occurred in the following locations: pharynx ten, esophagus eleven, larynx six, trachea three, bronchi four.

According to Burger's statistics more than half the foreign bodies in the food passages lodge in the mesopharynx and hypopharynx, particularly the latter. The reason for this lies in the fact that the hypopharynx normally is closed, its anterior and posterior walls being in apposition, and is the narrowest point in the upper food passage. As it happens, this location is also the most difficult to examine as it is necessary to retract the larynx forward in order to pass into the esophagus.

In the treatment of foreign bodies in the pharynx and esophagus the author points out the necessity for a careful external examination as well as an inspection by the indirect method inasmuch as one may diagnose complications which may indicate methods of treatment other than the insertion of the tube. For instance, Killian reported a case in which a man had swallowed a piece of glass while drinking. Examination showed emphysema along the inner border of the sterno-mastoid and the presence of bloody mucous about the entrance of the larynx. In this case esophagoscopy was contra-indicated and instead Killian did an esophagotomy, opening widely the already infected peri-esophageal tissues. On the other hand several cases are cited to show that foreign bodies may lie in this locality causing but very few symptoms. In children, the author uses general anesthesia; for adults cocaine-adrenaline 5-10 per cent. He recommends the sitting rather than the lying posture for adults.

A foreign body in the air passages gives rise to pronounced symptoms. Immediately after its inspiration there is an attack of coughing with laryngeal spasm and choking sensations; if the body lodges in the larynx or trachea there is hoarseness and stridor; if in the bronchi there may develop bronchitis, bronchostenosis, pneumonia, atelectasis, or lung abscess depending on how long the article remains as well as its character, whether infective or not. In eight cases in which the foreign body lodged in the larynx there was marked dyspnea, six of them requiring tracheotomy.

Another prominent symptom in all was fits of coughing immediately after the inspiration. The author is convinced that such cases as these demand prompt efforts at removal and cites several cases that might have made a better recovery had the laryngoscopy not been delayed. Four deaths are recorded in patients who showed pathology in the lungs and high fever when they were admitted to the hospital. His experience with the Roentgen ray for diagnosis has not been very encouraging and he is not inclined to put much faith in it. He quotes Eicken's statistics of 278 foreign bodies where the *x*-ray was positive in only 60 per cent. Metallic bodies were diagnosed in 92 per cent of 161 cases and non-metallic bodies in only 15 per cent. of 117 cases. He also claims according to Kahler's statistics that inspection by the bronchoscope located the foreign body in all but 0.7 per cent of the cases.

Endoscopic Surgery of the Esophagus and Respiratory Tract. Laryngoscopic, bronchoscopic and esophagoscopic equipment is not confined to the so-called big medical centers, for one can see such work, and very creditably performed, being done throughout the country. F. Root[1] says that the use of such instruments has made it possible to make examination in children, something that can not be done by the indirect method usually.

The method has a wide application in that it can be used for diagnostic as well as operative purposes.

Opinions differ as to the advisability of lower bronchoscopy in very young children. Brünig first suggested it because it facilitated work in the bronchial tube. Jackson seldom uses lower bronchoscopy whereas Mosher uses the method in patients under 3 years of age. When all is said, it still is a proposition for nicety in judgment.

An important application is as a diagnostic aid in diseases of the esophagus. General surgeons, on the whole have not taken up the method as it seems they should, and still prefer the passing of sounds and bougies.

[Either method is not without danger it may be said. —Ed.]

(1) Journal-Lancet, Aug. 1, 1916.

It is a personal matter whether one choses to use an anesthetic or not. Jackson thinks the fear of a "vagus reflex" is groundless.

Endoscopy of the Esophagus and Upper Air Passages in Children. Imperatori[2] gives the indications for examining the esophagus as follows: Acute dysphagia or aphagia indicating the presence of a foreign body, retropharyngeal abscess, stenosis due to scar formation following the imbibition of caustics. For examining the upper portion of the esophagus he uses Jackson's speculum.

The indications for examining the larynx and tracheobronchial tree are the following: suddenly developing dyspnea indicating the presence of a foreign body, which however must not be confused with laryngismus stridulus; acute hoarseness which is usually an inflammatory reaction developing in diphtheria or acute tonsillitis; dyspnea from various other causes such as papilloma, diphtheria, etc.; tracheal or bronchial diphtheria; prolonged coughing; lung abscess following tonsillectomy (the latter has been reported several times during the past year).

For examining the larynx, Imperatori uses the Jackson speculum, but for operative work within the larynx he prefers the Killian suspension laryngoscopy.

During bronchoscopy, which requires no anesthetic, one must watch the respiration very carefully. Deep inspiration or sudden rapid respiration indicates danger. One is always in danger of perforating into the pleura; such cases have been reported. Experiments on dogs have shown that such an accident leads to collapse of both lungs and death usually within a few minutes.

In the discussion, Yankauer stated that he always employs general anesthesia in children over a year or at most two years of age. MacKenty also recommends general anesthesia except in cases in which a very short examination is required.

(2) New York State Jour. Med., September, 1916.

DISEASES OF THE BRONCHI AND TRACHEA.

Treatment of Bronchial Asthma by the Endobronchial Spray. The results of this method of treatment are sufficiently favorable, Stephan[3] thinks, to merit a consideration of its technique. In the majority of cases there was a complete recovery: a number showed an improvement of greater or less duration, and a smaller percentage were uninfluenced.

Ephraim's statistics cover 103 cases of from two to forty years' duration. Eighty-eight of these patients were benefited; in sixteen the improvement was not lasting; seventy-two showed good results. In forty-eight cases there was a cure without recurrence. Of those patients who were free of return for more than a year (eighteen in number) seven received one treatment, six received two treatments, and five received three and four treatments.

Recurrences were found in eighteen cases at the following intervals after treatment: 1 to 3 months, 2 cases; 3 to 6 months, 7 cases; 6 to 7 months, 5 cases; 9 to 12 months, 2 cases; over 12 months, 2 cases.

Inasmuch as the true etiology of bronchial asthma is not definitely established it is difficult to say just how the bronchial spray achieves its results. The local findings such as redness and swelling of the bronchial mucosa bear no relationship to the severity of the affection and are not constant. Ephraim states that the catarrhal swelling causes irritation of the end fibers of the vagus which in turn produces reflexly spasms of the bronchial musculature and increased swelling thus causing a vicious circle. He believes that by anesthetizing these end fibers the circle is broken long enough for the irritability to be overcome.

Stephan employs from 5 to 10 c.c. of a 0.5 to 1 per cent. solution of novocaine together with 5 to 20 drops of a 1 to 1000 solution of adrenaline. Idiosyncrasies to either drug must be inquired into before using these solutions. The bronchoscope is inserted and the mucosa first inspected. Accumulations of mucous must be as-

(3) Deutsch. med. Wochenschr., Jan. 27, 1916.

pirated thoroughly because the solution acts better when directly in contact with the mucosa and is not so readily expectorated. The solution is sprayed in by means of a long spray tip which is introduced to the bottom of the tube.

The author states that other measures should not be omitted in the treatment, such as proper attention to nasopharyngeal disorders, inhalations, iodine therapy and general mechanotherapy and hydrotherapy.

Treatment of Asthma by Asthmolysin. Asthmolysin is said to consist of 0.0008 gm. of suprarenal extract plus 0.04 gm. of pituitary extract prepared in a 10 gm. solution for use in a special nebulizer. The original as prepared by the firm of Kade (Berlin) is accompanied by the necessary nebulizer which vaporizes the aqueous solution thus obviating the use of glycerine which has been found to cause irritation of the bronchial mucosa. Fisher[4] discovered by experiments that the pituitary extract when used alone aggravated the disease and that the suprarenal extract alone was far less efficacious than when used in combination with the former. It is therefore interesting to observe that in combination the pituitary extract loses its baneful effects and that the suprarenal increases in effectiveness.

Fisher claims great relief from asthmatic attacks through the use of this combination and recommends it particularly because of the ease with which the patient can use it, differing in no way from any other inhalation vaporizer. Furthermore it is not harmful to the patient by reason of long continued use as is the case with so many of the other bronchial sprays and inhalations.

Tracheobronchitis Due to Nitric Acid Fumes: Bronchoscopy: Drowning of the Patient in His Own Secretions Averted by Tracheotomy. A case is reported by Chevalier Jackson[5] which is interesting in the extreme. A young man, previously in good health, complained of burning sensation in the throat following two hours' exposure to nitric acid fumes. After half an hour his lips became blue; five hours later, the patient fell, becoming unconscious for a moment. Cough, dyspnea and

(4) Deutsch. med. Wochenschr., Oct. 26, 1916.
(5) New York Med. Jour., Nov. 4, 1916.

blueness of face and lips developed. Physical examination showed chest filled with crackles, and râles of all descriptions. Bronchoscopy showed intense acute tracheitis and bronchitis, the passages filled with a frothy mucopurulent secretion. Patches of grayish-furred mucosa could be seen when the secretion was wiped away.

Tracheotomy was advised and performed. Large quantities of mucus were wiped away continuously and the air passages were cleared by gentle swabbing through the tracheotomy wound. At the end of the fourth day the patient could cough out the secretions. A croup kettle with compound tincture of benzoin was used all the time.

Tracheotomy in this case gave easier access to the bronchi for removal of the secretions which otherwise could not have been removed. It would not be indicated wherever the underlying cause was incurable, such as thoracic cancer, aneurysm, etc.

The disappearance of the coughing reflex is not explained.

Tracheobronchial Syphilis. A review of the literature on this subject by Arrowsmith[6] disclosed 135 cases, which are classified as follows: 1. Gummatous enlargements, circumscribed or diffuse. 2. Ulcers, single or multiple. 3. Endotrachial connective tissue new growth; (*a*) distinct scars, (*b*) diffuse thickening. 4. Fibrous peri-tracheitis or tracheo-bronchitis.

The condition is not a rare one and the author states that the diagnosis is not difficult provided one bears in mind the possibility of this disease occurring in a given case.

Jackson recently described four cases coming under his observation; in one there was a cicatricial web in the trachea, in another there was an ulceration of the carina, and in the other two there were sessile tumors on the right posterior wall of the trachea.

The two cases reported by Arrowsmith are as follows:

A man of 44 complained of paroxysms of coughing and shortness of breath for the past two and a half years. There was expiratory dyspnea and cyanosis. Examina-

(6) New York Med. Jour., June 24, 1916.

tion disclosed impaired resonance at the left base of the lung with diminished fremitus and fine râles at the end of inspiration. The Wassermann reaction was strongly positive. Bronchoscopic examination revealed a symmetrical narrowing of the lumen of the trachea covered by an apparently normal mucosa. By pressure it was possible to pass the constriction, which, however, appeared to be unyielding.

The second case was that of a man who in addition to presenting specific lesions in the larynx, showed under bronchoscopic examination a sessile fungating mass the size of a large pea which was located on the posterior wall of the trachea about one inch from the carina. Part of this mass was removed and was found pathologically to be syphilitic.

The mucosa of the trachea was very much engorged, so much so that the rings for the greater part were indistinguishable. Under proper antiluetic treatment the patient recovered.

Use of Intratracheal Insufflation in Treatment of Poisoning. Schniffner[7] conducted a number of experiments using the tracheal catheters and containers of anesthetics and oxygen, either of which could be insufflated as required. The results are thus summarized:

By intratracheal insufflation one obtains an anesthesia of long duration in animals, especially dogs. Should respiration be suspended during ether or chloroform anesthesia, it can be quickly restored by insufflating fresh air. Also marked disturbances of the circulation may thus be rapidly overcome. However, they were never able to restore the heart beat after it had ceased.

Such poisons as are normally lethal by paralysis of the respiratory center are found to be less toxic when insufflation is employed.

THE LARYNX.

Laryngostomy. Laryngostomy for chronic stenosis of the larynx has been very successful in the hands of L. Mahler.[1] The operation can be performed without

(7) Abst. Int. Centrbl. f. Laryngol. u. Rhinol., December, 1916.
(1) Ugesk. f. Laeger., July 6, 1916.

much trouble and with the anatomic structures before one.

His first patient, a girl of 17, had worn a tracheotomy tube thirteen years. The larynx was opened and the fibrous tissue which had formed was removed. The wound was drained, old fistulas healed and a Gluck plastic operation done. The patient regained the lost functions, *i. e.*, good breathing and voice, in a year's time. Various other procedures had been previously tried.

In another case, a girl of 8 had had five operations for recurring polypi of the larynx and had worn a tube for three years. The same operative procedure was used with good result.

[The change in opinion from the use of the direct method by means of the suspension apparatus to the application of the old operation of laryngostomy can be seen to be gradually coming. There were at first many enthusiasts who believed the suspension apparatus technique had scarcely any limitation in its application, and these same enthusiasts after giving the method a fair trial can now see a more limited application so far as *operative procedures* are concerned.—Ed.]

Angioma of the Larynx. E. Mayer's[2] patient, aged 52, had been hoarse for a year. Six months previous to the beginning of this attack, she had been hoarse for a time and then there was a profuse hemorrhage, after which the hoarseness disappeared for some months. A tentative diagnosis of carcinoma had been made. On examination there was found a "dark, bluish-gray mass, yielding to the probe, generally rounded and extending downward on the left side from the under surface of the false cord, and completely hiding the true cord, without having the external appearance of a cancerous growth." A diagnosis of angioma was made by Mayer, who advised removal by laryngotomy. This was successful.

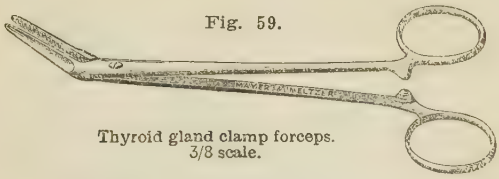
The literature is reviewed; forty-one cases had been reported.

Laryngo-fissure should be the method of choice, as all bleeding can be controlled readily.

(2) Med. Record, June 17, 1916.

The Operation of Laryno-Fissure—Some New Instruments Specially Designed for Improving the Technique. I. Moore[3] says that the previous difficulty in entering the larynx has been in going through the thy-

Fig. 59.



Thyroid gland clamp forceps.
3/8 scale.

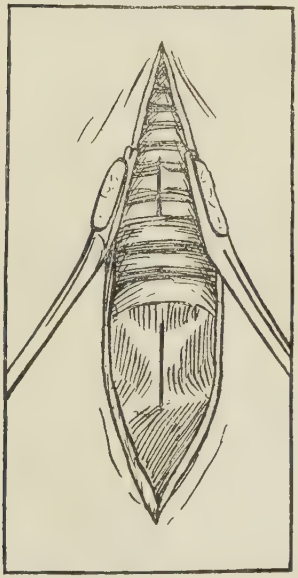


Fig. 60. Shows the clamp forceps in position and the incisions made in the thyroid cartilage in thyro-fissure and in the trachea. ½ scale.

roid cartilage. The oozing from the severed thyroid isthmus has been troublesome. Moore has devised a clamp for the thyroid isthmus, a self-retaining retractor

(3) Lancet, Oct. 14, 1916.

for thyroid cartilage and a powerful forceps for the cartilage, which he claims facilitates the operative procedure greatly. (See figures 59, 60, 61, 62).

Laryngocele. By laryngocele is understood an air-containing dilatation of the sinus Morgagni, that is, a

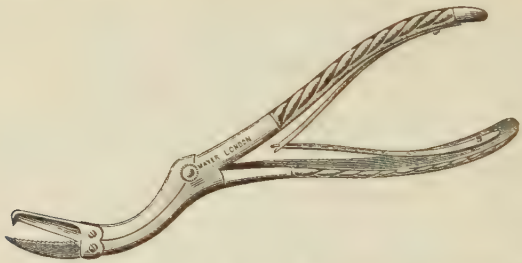


Fig. 61. Thyroid cartilage shears, $\frac{3}{8}$s scale. Laryngo-fissure. (See page 339).

supraglottic cavity lined with ciliated epithelium. According to von Hippel, we distinguish two types, the preformed, that is, those that develop spontaneously, and the type that develops as a result of some other disease of the larynx. M. Weingartner[4] cites two cases of his own to add to the twenty-eight that are found in the literature. His first was in a woman of 64 who came for relief of choking spells and who presented an elastic tumor the size of a hen's egg filling the anterior triangle of the neck. Both puncture and the *x*-ray showed the contents to be air. The Roentgen ray is particularly useful in differentiating between laryngocele and a cyst. The second case occurred in a man of 39 and was found on autopsy to consist of a dilatation of the ventricle of Morgagni. In this case the *x*-ray was not employed.

Bilateral Laryngeal Abductor Paralysis in Tabes of Central Origin. Inasmuch as recurrent laryngeal paralysis of tabes has been generally considered to be of peripheral origin, E. D. Davis'[5] case being an exception is very interesting. The patient had had syphilis for ten years and tabes for two years past. His laryngeal symptoms were attacks of dyspnea with stridulous breathing,

(4) Archiv. f. Laryngol. u. Rhinol., Vol. 30, No. 3.
(5) Jour. Laryngol., Rhinol., and Otol., September, 1916.

the cords being completely adducted, showing a very small chink in front and behind the vocal processes. The patient died during one of these laryngeal crises despite an emergency tracheotomy.

The examination of the cord and medulla showed an unusual degeneration or atrophy of both afferent and

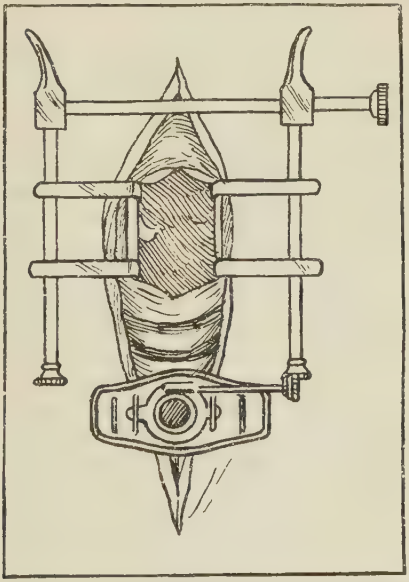


Fig. 62. Shows the two halves of the thyroid cartilage held apart by the self-retaining retractor, exposing a full view of the inside of the larynx. On the right vocal cord is seen the growth. Laryngofissure. (See page 339).

efferent systems of neurons, thus making the case one of amyotrophic tabes or combined sclerosis. In the medulla there was a sclerotic lesion affecting the nuclei of the glossopharyngeal, vagus, and spinal accessory nerves. There was no inflammation around the cells, meninges or nerve roots, but atrophy of the cells and nerve trunk of the vagus was pronounced. The slow progress of the atrophic process in this case is of importance and the fatal issue was due rather to the dangerous localization of the process rather than to its real extension.

The larynx showed no abnormality except atrophy of

the crico-arytenoidens posticus; its nerves could not be demonstrated. The occurrence of laryngeal crises is explained by Semon in this manner: while the medullary nuclei of the abductors are the first to succumb to gradually destructive processes, the ganglionic centers are in a condition of increased irritability and react more promptly and more intensely upon reflex and peripheral irritation.

Primary Tuberculosis of the Pharynx and Larynx in a Man of 69. This case is reported by J. B. Horgan.[6] A priest, aged 69, had complained of hoarseness and dysphagia for two months. There was loss of weight and vigor. Examination showed an ulceration of the right tonsil with typical findings of laryngeal tuberculosis. A biopsy for microscopic examination showed caseous areas and giant cell nests. No physical signs were found in the chest. The tonsil was enucleated and the dysphagia relieved, but the patient developed purpura hemorrhagica from which he succumbed. During the entire course there were no pulmonary symptoms or signs.

Tuberculosis of the Larynx with Special Reference to the Use of Tuberculin. A tuberculous lesion in the upper respiratory is looked upon as a secondary lesion, or a new lesion in a patient who has acquired a certain amount of immunity. The tendency in such lesions is to heal and a hopeless prognosis should not always be entertained.

In H. Hastings'[7] series of 4,719 cases, there were 99 laryngeal lesions, or 2.1 per cent. In the ear, nose and throat clinic of the Los Angeles Medical Department, California University, in a series of 14,042 cases there were 108 cases showing laryngeal involvement, or 0.7 per cent.

In the Barlow Sanitarium, among 743 cases of pulmonary tuberculosis, there were thirty-eight cases of laryngeal involvement, or 5.1 per cent. This is considered a low percentage for such an institution because such cases are excluded as much as possible.

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(6) Jour. Laryngol., Rhinol., and Otol., January, 1916.
(7) Laryngoscope, May, 1916.

Unlike Bandelier and Ropke, Hastings has seen two cases of laryngeal tuberculosis develop in patients treated with tuberculin. These cases did not progress beyond the stage of infiltration, however.

The majority of the laryngeal cases were associated with second and third stage pulmonary lesions in which there was abundant sputum. In two cases, the infection apparently occurred through the lymph or blood. Hastings emphasizes the frequency of lowered general resistance as the important factor in laryngeal involvement.

Ulceration was found most frequently in parts covered by thin mucous membrane rather firmly adherent to the underlying structures such as the epiglottis, vocal cords and vocal bands. The other parts with a good blood supply seem to escape ulceration. Infiltrations around the arytenoids and arytenoid folds seem most often to cause pain.

Laryngeal cases suitable for tuberculin therapy show a satisfactory lung condition demonstrating some resistance to the infection.

Eight cases in which bacillus filtrate and bacillus emulsion were used are reported in detail. Of these five patients are living and three dead.

The author believes in the efficacy of tuberculin treatment intelligently administered in selected cases.

Laryngeal Abscess—With a Report of Three Cases. Fortunately, laryngeal abscess, says M. J. Ballin,[8] seems to be an infrequent condition and, it is said, rarely met with in children. An abscess may arise as a primary infection, having its origin in the larynx proper, without any apparent predisposing cause. It may develop secondarily to an acute inflammation of the tonsils, nasal or postnasal structures, and, by continuity, extend downward toward the laryngeal structures. The condition may be extralaryngeal or intralaryngeal and in the latter case it is of more serious consequence. It is not merely the collection of pus, but the infiltration surrounding the process that gives rise to the urgent symptoms.

Intubation is contra-indicated, tracheotomy being the operation of choice when symptoms become urgent. Cold applications externally are grateful. Ballin's patients

(8) New York Med. Jour., Oct. 21, 1916.

were relieved by incision of the abscess by means of a concealed knife by indirect laryngoscopy. In one case a small piece of bone had been swallowed which was later coughed out after which rapid recovery took place.

The literature is partly reviewed.

Chronic Laryngeal Stenosis—Report of Two Cases. In the first case, reported by P. S. Mertins,[9] that of a baby 13 months old, intubation was successfully used until the child was allowed to go home intubated and during the night auto-extubation took place with fatal issue. The fact that intubated patients need hospital care is emphasized.

The second case, one of laryngeal diphtheria, was under observation from September to the following August. There had been several intubations with resulting cicatrix within the larynx, causing stenosis which required tracheotomy. Later, a silk thread was passed from below up and forcible dilation used followed by intubation with a pin tube of Dupuy. The final issue was satisfactory.

"The marked increase in dyspnea after unsuccessful attempts at intubation has taught me that in every intubation case we should have everything ready for immediate tracheotomy."

[It has always seemed to me that unless the patient could be under constant observation at all times, tracheotomy was safer in such cases as this.—Ed].

Window Resection of the Larynx for the Removal of Intrinsic Malignant Disease. Hoarseness is a symptom which calls for careful examination of the larynx. In the case F. Adams[1] reports the patient complained of hoarseness, and examination revealed a carcinoma involving the left vocal cord.

Thyrotomy has been the operation of choice in such cases, but Adams believes that when the pathologic condition is well localized window resection is preferable. The steps of the procedure can be briefly summarized as follows:

The larynx is exposed and low tracheotomy performed; the larynx is opened by a median incision, extending

(9) Southern Med. Jour., November, 1916.
(1) Northwest Medicine, October, 1916.

from the thyroid notch to the upper border of the cricoid ring, or through the ring, if necessary. The incision is deepened until the interior of the larynx is opened, when retractors are used. Reflected light is used to ascertain the upper and lower limits of the disease process. The perichondrium is turned off the ala of the thyroid cartilage as far up and back as necessary. Cutting forceps or strong scissors are used to sever the cartilage and mucous membrane of the larynx. Sufficient exposure is made to insure completeness. The operation is completed by making a posterior median incision and removing cartilage, mucous membrane and tumor in one piece.

"The perichondrium detached from the removed cartilage is united with one or two sutures to the opposite cartilage, the packing and tracheotomy tube removed as in ordinary thyrotomy." [Whatever that means.—Ed.]

Later it is said the tracheotomy tube was left in position two days. Convalescence was uneventful.

The Percy Treatment of Cancer of the Nose and Throat, with Special Reference to the Larynx. J. C. Beck[2] gives the reason why cancer surgery is so often a failure: First, the patients present themselves too late to make an early diagnosis. Second, failure to make an early diagnosis. Third, timidity in operating extensively, especially in the removal of the tributary glands. Fourth, implantation carcinoma along the field of operation.

All four of these reasons are more easily circumvented in cancers of the nose and throat, especially of the larynx.

This method of treatment was first recommended by Dr. Percy for inoperable uterine cancer, but subsequently also for operable cancers of the uterus as well as other parts of the body. Beck has employed the method for cancer of the nose (carcinoma and sarcoma), carcinoma of the upper jaw, lower jaw, nasal and aural, and hypopharynx, tongue, lip, thyroid gland, external ear and larynx.

The Percy method is a slow one in destroying the carcinoma *in situ* by a sort of cooking of the tissues and subsequent sloughing or discharge. The ultimate cica-

(2) Bull. Chicago Med. Soc., Nov. 4, 1916.

tricial formation is the one objectionable feature that Beck has found.

He has not observed ulceration as a complication. He has had one case of carcinoma of the larynx in which he did not cool the neighboring tissues sufficiently, and in which a large thyroid gland was present. A hemorrhage on the tenth day, most probably from a sloughing of the gland, filled up the patient's lung rapidly and choked her before help could be obtained. In most of the pharyngeal cases, which were all very far advanced, he had fatalities because the operations were very extensive. In a case of carcinoma of the tongue he had a perfect result, in that there was no recurrence at the site of operation six months later. The patient disappeared soon after operation and the glands of the neck were not removed. Six months later he returned with a mass of glands.

A case of cancer of the nose was interesting in that the epithelioma was very large and protruding, and the fact that the *x*-ray appeared to make it grow rather than retard its growth. The result from the coagulation operation was perfect. Subsequent plastic work was necessary to close the defect.

In treating the various parts of the nose and throat by the Percy method it was necessary for Beck to develop a special technique and instruments, since those employed for uterine work were not applicable. In the cases of intranasal cancer he employs a longer electrode than that which accompanies the Percy set, and a specially devised cooling nasal speculum. For the pharynx, a similar device was constructed.

Recently the Percy iron has a cooling jacket that makes this pharyngeal speculum superfluous. To cool the external portions of the neck the author employs an ice-bag or the Geiter's coils. In the operation on the larynx he makes use of a cooling tube in the esophagus. In cases requiring operation on the larynx by the direct or internal method, which is also known as the suspension-laryngoscopic method, he has employed a specially devised laryngeal speculum, but this, too, would now become superfluous, since the Percy iron has a cooling jacket. The electrode employed by this route is neces-

sarily much longer. In presenting and reporting the cases of cancer of the larynx Beck stated that he was reporting them altogether too early to claim any cures. He said, however, that sufficient time had elapsed for the patients to have had recurrences and metastatic growths. Two had had particles of tissue removed very recently and found not to be cancerous. The idea of substituting a laryngotomy and removal of the growth by the Percy method for laryngectomy might be stated as follows:

1. The patient would consent more readily to an operation when promised that he might have a voice, even though not normal.

2. He might even hope to have a normal breathing tube; that is, not to have to wear a permanent tracheotomy tube. Should he have to wear a permanent tube on account of cicatricial contraction, then it was possible for him to wear one which the author has devised and which could be automatically obstructed when desired to speak, without placing the finger to the tube and becoming an object of curiosity. This is a tracheotomy tube, except that it has a shuttle, which is operated by means of a flexible rod from the patient's pocket or sleeve.

3. The operation is not dangerous.

A Fatal Case of Edematous Laryngitis. An unusual fatal case reported by A. Kidd[3] is that of a young sailor, aged 22, who suddenly complained of difficulty in breathing. His shipmates, thinking it might be some food, inverted him rigorously and there was temporary relief. The difficulty became more severe and in forty-five minutes following the onset the patient was dead. Postmortem showed a small scar at the tip of the epiglottis with a small ulcer on the mucous membrane at the base adjoining the larynx. "The epiglottis itself and aryepiglottidean folds were swollen and edematous and almost meeting in the midline."

It is an unusual case because of the rapidly fatal issue with no symptom other than urgent dyspnea.

Radium in the Field of Laryngology. D. B. Delavan[4] says: "The study of radium is in its infancy." Pub-

(3) Lancet, June 24, 1916.
(4) Med. Record, July 8, 1916.

licity is not needed, but rather scientifically proved data from reliable sources. Conservative observers are willing to admit, however, that "encouraging progress" is being made, notably Robert Abbe, of New York, and two British institutions, the Radium Institute of London and the Royal Infirmary of Edinburgh.

Results in the treatment of "vernal catarrh" have been promising, as there has been no recurrence in a series of years.

Radium used in non-malignant intralaryngeal growths has been successful in causing disappearance of the growths together with restoration of function.

The final value of radium in malignant disease has not been proven. The Royal Infirmary gives a sanguine outlook. "While in advanced malignant cases a cure may not have been effected, yet in practically all treated more or less benefit was produced, through the relief of pain, the cessation of discharges, the healing of ulcerative surfaces, the removal of local growths, and the prolongation of life." Malignant disease of the posterior nares, buccal cavity and adjoining regions seem less amenable to treatment, but this may be due to the difficulty in administering a sufficient dose.

Delavan's experience has been quite unusual. In two cases of epithelial carcinoma, originating in the left side of the throat close to the wall of the larynx, with ulceration with marked aphonia and dysphagia, massive doses of radium were administered. The first effect was "an almost immediate control of the secretions." The ulcerative areas rapidly diminished in extent, the infiltrative areas diminished in extent and the lost functions were in a good measure restored, together with a marked improvement in the general health.

Delavan again emphasizes in closing that the use of radium is only in its infancy and that failures should only spur us forward, for we know "radium will destroy a superficially located cancer cell."

Affections of the Larynx in Soldiers. The large number of cases in young men in which there is no apparent retrogression in the tonsils and adenoids is surprising. Disturbance from these causes was frequent among soldiers during the severe winter months,

especially in those individuals not accustomed to mouth breathing.

G. Ferreri[5] commends what he calls local medicated baths of the hypopharynx as more effectual than gargling. "A swallow of the disinfectant solution is taken into the mouth and the head is bent over backward until it almost touches the spine." With a little practice one can learn to breathe at the same time, it is said.

Those subject to throat affections should be very moderate in the use of tobacco and alcohol, avoid too hot or too cold drinks, avoid singing or shouting in dusty places.

Edema of the larynx which does not yield to an astringent spray may require tracheotomy; intubation is almost impossible and dangerous in this condition.

[Ferreri's point about throat affections in those not accustomed to mouth breathing is important, for it is not unusual under such circumstances to look for a cause in the throat, whereas the real causal factor is an obstructed nose. The throat has no capacity for carrying on the function of the nose and so the irritation of the inspired air which has not been warmed and moistened produces striking effects in many cases. When the nasal condition has been corrected very grateful results are obtained.—Ed.]

A Simple Inhaler for Use in Laryngeal Tuberculosis. L. W. Bickle[6] believes in some method of continuous inhalation in cases of laryngeal or pulmonary tuberculosis as a relief from the cough and possibly also to prevent infection of others. He suggests a very simple means of carrying this out. The inhaler is merely a new wooden pipe "if for male patients preferably with a cover. A small piece of absorbent wool is lightly packed into the bowl of the pipe like a plug of tobacco. The wool is saturated with the inhalant preferred, and the patient is directed to draw in air by the mouth and then closing the lips on the stem of the pipe (or removing it as preferred) to breathe out through the nostrils. The process can be repeated as often as desired, the only essential thing being that the air is not expired through the pipe.

(5) Policlinico, Feb. 6, 1916.
(6) Med. Jour. Austral., February, 1917.

Once a day is often enough to change the wool, but fresh supplies of inhalant can be added at frequent intervals. Of course, it is a dry smoke, *i. e.*, it must not be lit; this is one reason for using a cover. A man does not mind being seen with an unlit pipe in his mouth, the cover prevents the wool being seen, especially if the inhalant be dark enough to color the wool."

The author's prescription is:

℞	gm. or c.c.
Bals. Peruviana	4
Ol. Eucalypti	14
Ol. Pini Sylvestris q. s. ad	32
Fiat guttae	

Sig. Use as an inhalant as directed.

Guiacol, creosote or iodine may also be used. In laryngeal cases a special inhalant containing chloroform may be used before taking nourishment.

A Transilluminator with New Possibilities. The in-

Fig. 63. New transilluminator.

strument illustrated and extensively advertised by Sharp & Smith is highly recommended by W. G. Reeder.[7] One feature of it is that it can be carried, unlike the usual clumsy transilluminator. It is small enough to be used in the external auditory meatus, which is an advantage.

Various Types of Respiratory Contra-Action of the Vocal Cords. There are certain individuals, says Pollak,[8] whose vocal cords during respiration move in opposite direction from the normal; that is, on inspiration the glottis becomes narrowed and on expiration it widens. This condition, which often lasts months and years and may lead to marked dyspnea, is known in the literature under various names: Perverse action of the vocal cords, chorea laryngis inspiratoria, contra-action of the cords, inspiratory functional vocal cramp. There are four or five types of this affection which vary according to vari-

(7) Jour. Amer. Med. Ass'n., April 29, 1916.
(8) Monatschr. f. Ohrenhlk., Vol. 50, p. 381.

ous laryngeal pictures they present. In principle they are all the same, that is, the inspiratory act instead of spreading the cords as in the normal brings them together. Also many cases are accompanied by twitching of the arytenoids, trembling and rhythmic or incoordinated movements of the cords.

These cases are to be differentiated from double posticus paralysis. In the latter, stridor and dyspnea become more pronounced during sleep or narcosis, whereas respiratory contra-movements of the vocal cords of functional origin disappear. Also in the latter it will be noted that after a certain number of stridorous inspirations, the breathing becomes quiet, thus showing that momentarily at least the cords act normally. Furthermore, during the examination of these patients the width of the glottis is found to vary considerably. The diagnosis may be clinched by having the patient phonate for a long time while examining with the mirror; the consequent air-hunger leads to a sudden widening of the glottis with the next inspiration, thus proving that the abductors are intact.

The treatment should be constitutional and psychotherapy.

Disorders of Speech

Speech Disturbances in War. Froeschels[8] had under his care seventy-eight men who had been discharged from the hospitals with healed surgical lesions, but who were suffering from various kinds of speech disturbances due to wounds received in battles. He divides these into three groups: (1) visible wounds of the central nervous system; (2) wounds of the peripheral speech organs; (3) neuroses.

As an example of the first type he cites the case of a soldier who suffered a punctured wound of the occiput. There resulted a double facial paresis. The skull was trephined and several fragments of splintered bone and shrapnel ball removed. Speech was indistinct and there was weakness in the limbs. Examination of the speech disclosed first of all a bradylalia and rhinolalia aperta.

(8) Wien. klin. Wochenschr., Nov. 11, 1915.

There was anamnestic aphasia. To test the aphasia more correctly the author assembled an "aphasia box" containing removable compartments, in each of which was a model of some article of daily use, such as cooking utensils, various foods, working tools, animals, wagons, etc. The patient was given one model at a time and with a stop watch the exact time was noted that it took him to name each article. For instance, it took the man twenty-two seconds to name a salt-cellar.

The treatment in this case consisted of articulation, exercises and repetition of stories sentence by sentence. After two months' treatment the speech was almost normal.

The second group comprises injuries to the larynx, jaws, tongue, and palate. Wounds of the tongue with resultant adhesions require massage and articulation exercises. For this purpose the author uses an ivory plate that is held against the lips by rubber bands carried behind the auricles, which the patient wears during the day, being instructed to practice pushing it with the tongue away from the lips. Two cases resulting in great improvement by this method are cited by the author. A palato-electromasseur was also demonstrated which is used to strengthen a weakened soft palate.

Of the third group of cases, the hysterical loss of voice, stuttering, and hoarseness, the author presented several cases which were cured by the Gutzman-Denuhard exercises.

Rational Treatment of Stuttering. According to M. Scripture and E. Jackson,[9] the aim of the treatment for stuttering is to cure the patient of his pernicious speech habits and to teach him correct habits of speech. By these are meant proper posture, respiration, articulation, phonation, fluency and thinking. Prior to instituting such training it is necessary that the patient's general condition be good and that all physical and nervous defects of the organs of speech be removed. The actual correction of stuttering must be given over to a properly trained speech teacher, since the treatment is entirely pedagogic.

Posture: By this is meant the proper way for the

(9) Laryngoscope, February, 1917.

patient to sit or walk and includes the attitude of the head, the chest and the trunk. The pupil is taught to avoid cramping of the muscles, which indicates the useless expenditure of nervous energy and interferes with speech. The muscles of the face, neck and larynx particularly must be relaxed. Physical relaxation leads to mental relaxation and thus removes a psychic hindrance to easy speech.

Breathing: Breathing exercises are of two varieties, those intended to develop the chest, and those concerned with the control of speech. For the latter, the pupil is taught to inhale quickly and deeply, and without straining, with the mouth slightly open. Exhale slowly through the open mouth. After this is acquired the pupil is given the following exercises:

"1. Say a vowel on the outgoing breath and hold it as long as the breath lasts, without straining.

"2. Say a vowel, two, three, four, five or six times on one breath with pauses of various lengths between them.

"3. Count as far as possible on one breath.

"4. Say the alphabet as far as possible on one breath.

"5. Say sentences on one breath gradually increasing their length.

"6. Say long sentences which require one or more helping breaths to re-inforce the original breath.

"7. The stutterer must be taught to breathe consciously until right breathing becomes a habit."

Phonation: To avoid monotony of voice and to increase its flexibility, vowel exercises, singing scales, arpeggios and songs are practiced.

Articulation: The pupil is taught the proper position of the lips, tongue, soft palate, and jaw for each consonant and vowel, and is drilled in them in order to acquire control over these various organs.

Fluency and Thinking: Stutterers usually lack confidence in themselves, and although they may learn readily to read and recite, they often fall back to their old habits when left to speak spontaneously. The patient must be taught confidence in himself. For this purpose he is given exercises where he must supply missing words in a text, or answering simple questions, etc., until he

acquires that degree of confidence and fluency of thought necessary to proper speech. Also exercises in rhythm, such as in music and poetry, are found to be helpful.

The authors find that children respond more readily to the treatment than adults, their minds being more plastic and their mental attitude being less fixed. Adults require greater psychic impression.

In conclusion, the authors set forth their "Ten Commandments of Speech," which they have found very helpful:

"1. Say to yourself, 'I have no fear. I know that I can speak well.'

"2. Think before you speak.

"3. Always speak quietly and calmly, with all the muscles relaxed.

"4. Always speak slowly and carefully.

"5. Stand and sit quietly and erect when speaking.

"6. Before speaking inhale quickly, deeply and without straining, with the mouth open.

"7. Be very careful of the first two words of each sentence.

"8. Always lengthen and strengthen the principal vowels.

"9. Be especially careful to lengthen the short vowels.

"10. Be honest with yourself. Do not try to avoid words that you think are difficult."

Importance and Prophylaxis of Disorders of Speech and Voice in School. Not a new field, but a field of medicine which has an extensive application is coming into its own, namely, that of voice defects, says D. H. Abbott.[1] Everyone realizes its importance, but because of its difficulties men tend to shun it.

Gutzman has shown that there are 200,000 children in Germany with voice defects and that 23 per cent. are backward.

Stammering decreases during the first school years, but the number of stutterers increases, especially in the seventh and eighth grades, and is probably due to the increased school work coming at the termination of a relatively rapid period of cerebral growth. It is plain to see that the physician must warn against too strenu-

(1) Lancet-Clinic, Oct. 21, 1916.

ous work for children with family taints and those who are shy and easily frightened.

It will be necessary to take great care in the training of such afflicted children and above all they must not be exposed to ridicule. Much improvement comes with praise of their efforts and the confidence they acquire.

The causative factors in chronic hoarseness in children are not the affections, inflammatory in nature, of the upper respiratory tract, as generally supposed, but the improper use of the vocal apparatus in chorus singing, etc.

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